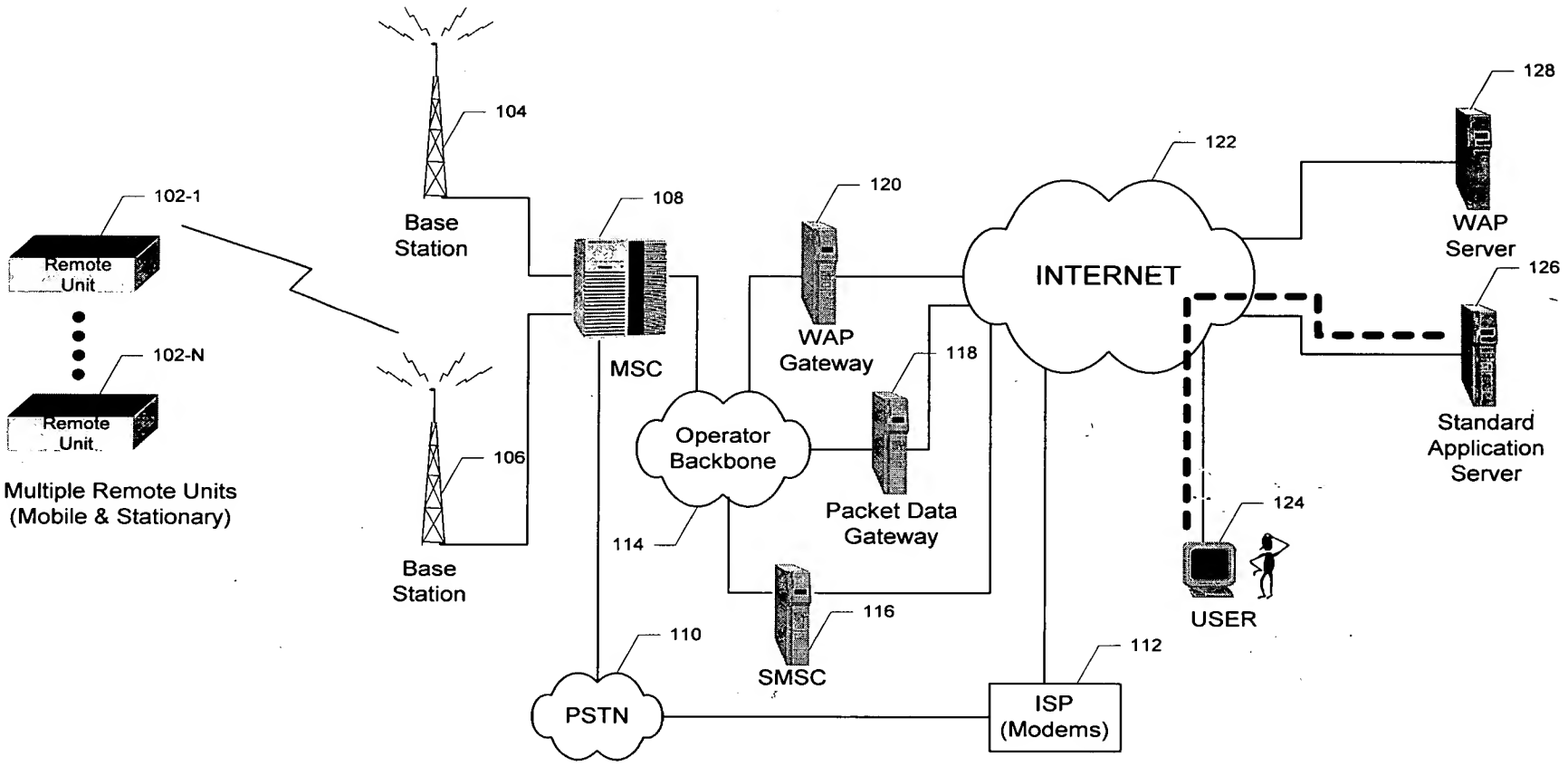
102-1
Remote Unit
102-N
Remote Unit
Multiple Remote Units (Mobile & Stationary)
104
Base Station
106
Base Station
108
MSC
120
WAP Gateway
122
INTERNET
128
WAP Server
126
Standard Application Server
118
Packet Data Gateway
Operator Backbone
114
116
SMSC
110
PSTN
112
ISP (Modems)
124
USER

Figure 1a

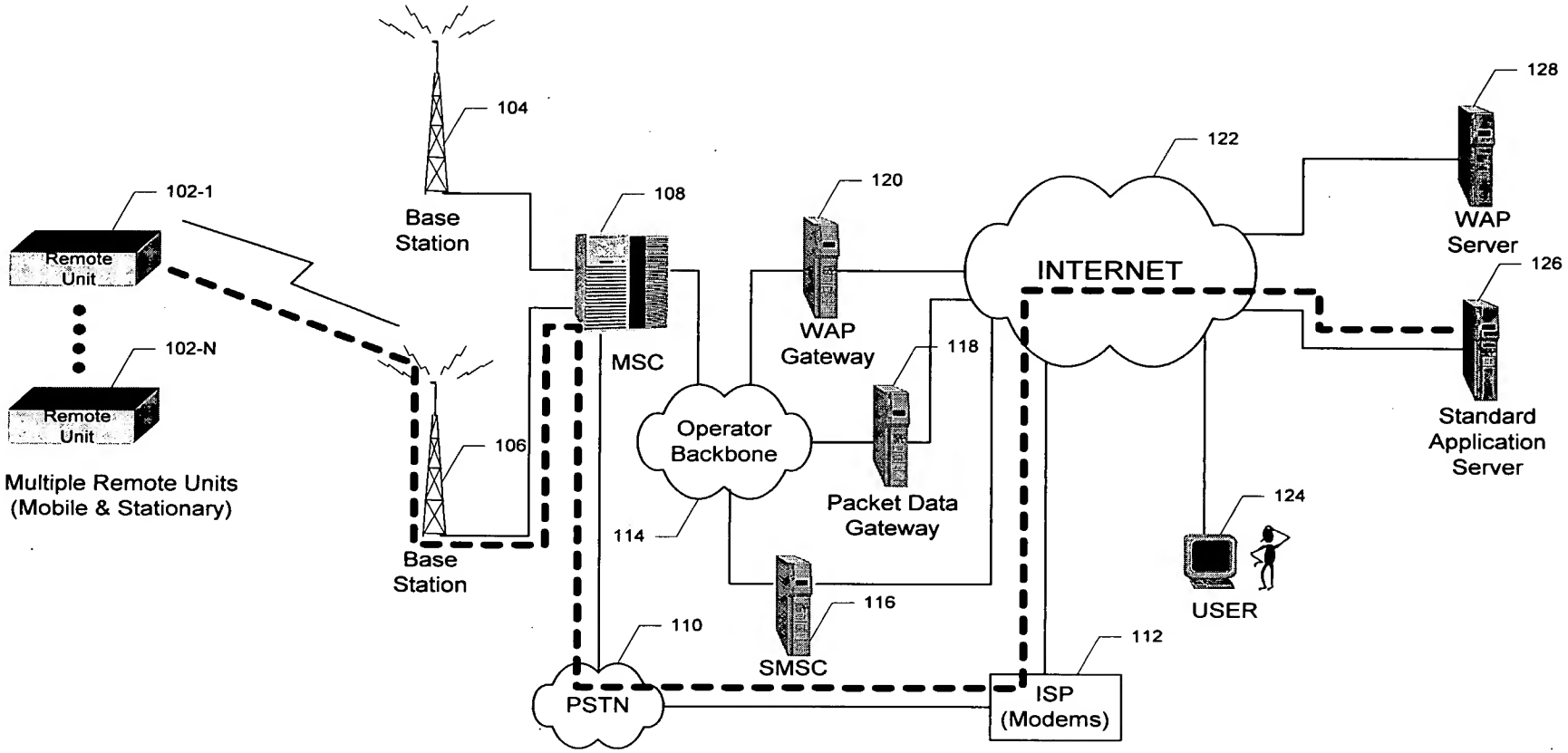
102-1
Remote Unit
102-N
Remote Unit
Multiple Remote Units (Mobile & Stationary)
104
Base Station
106
Base Station
108
MSC
120
WAP Gateway
122
INTERNET
128
WAP Server
126
Standard Application Server
118
Packet Data Gateway
Operator Backbone
114
116
SMSC
110
PSTN
112
ISP (Modems)
124
USER

Figure 1b

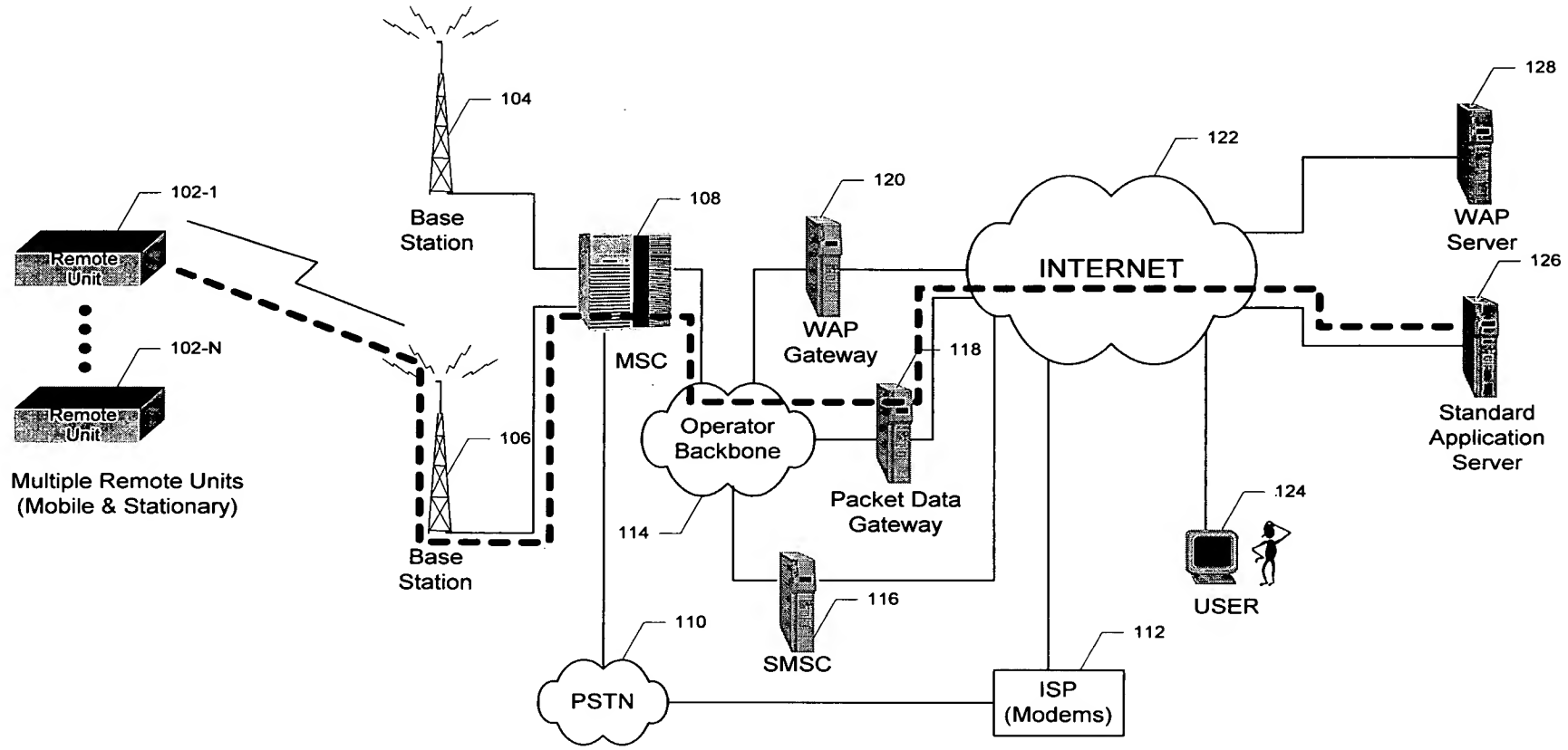
102-1
Remote Unit
102-N
Remote Unit
Multiple Remote Units
(Mobile & Stationary)
104
Base Station
106
Base Station
108
MSC
114
Operator Backbone
120
WAP Gateway
118
Packet Data Gateway
122
INTERNET
128
WAP Server
126
Standard Application Server
124
USER
116
SMSC
110
PSTN
112
ISP
(Modems)

Figure 1c

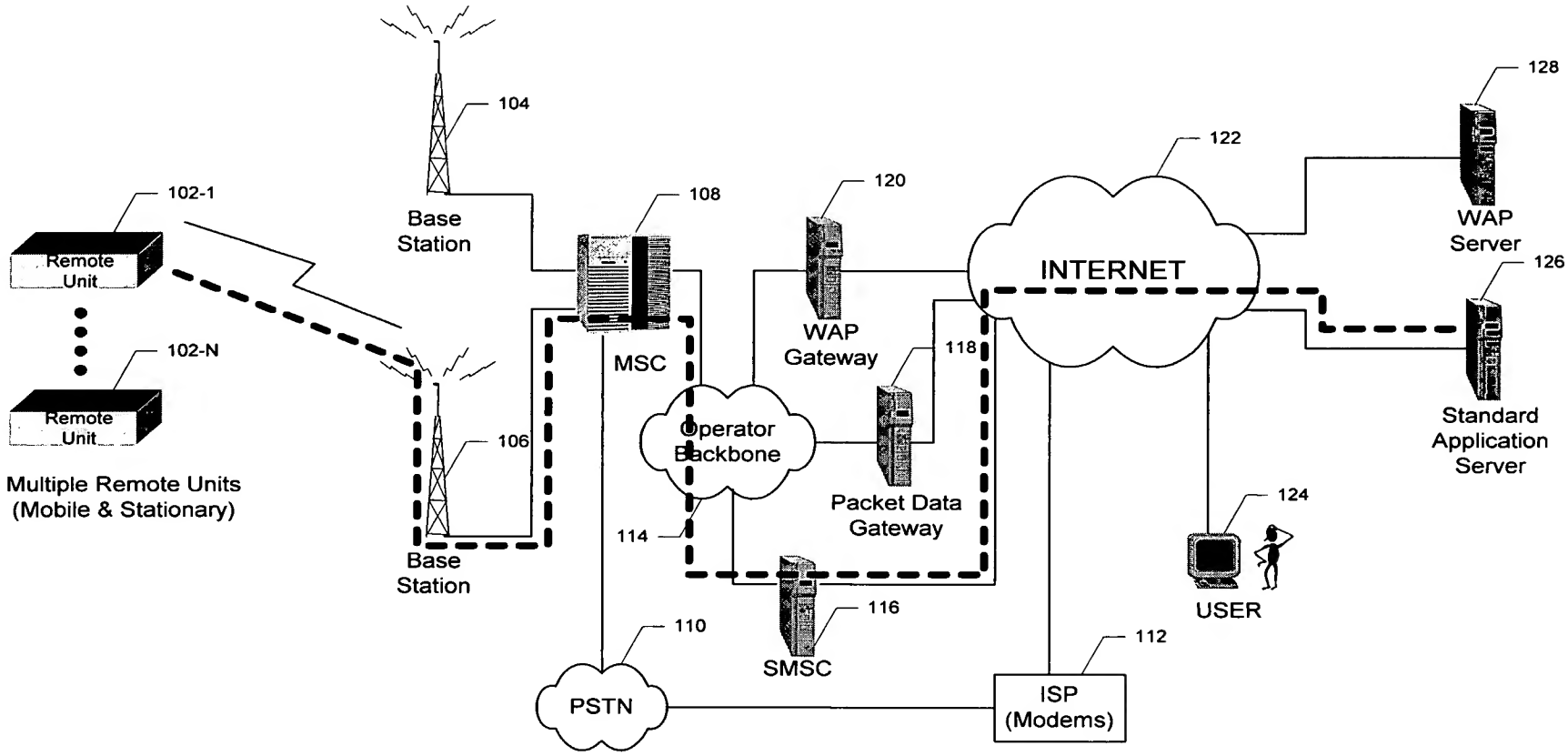
102-1
Remote Unit
102-N
Remote Unit
Multiple Remote Units (Mobile & Stationary)
104
Base Station
106
Base Station
108
MSC
120
WAP Gateway
122
INTERNET
128
WAP Server
126
Standard Application Server
118
Packet Data Gateway
Operator Backbone
114
124
USER
116
SMSC
110
PSTN
112
ISP (Modems)

Figure 1d

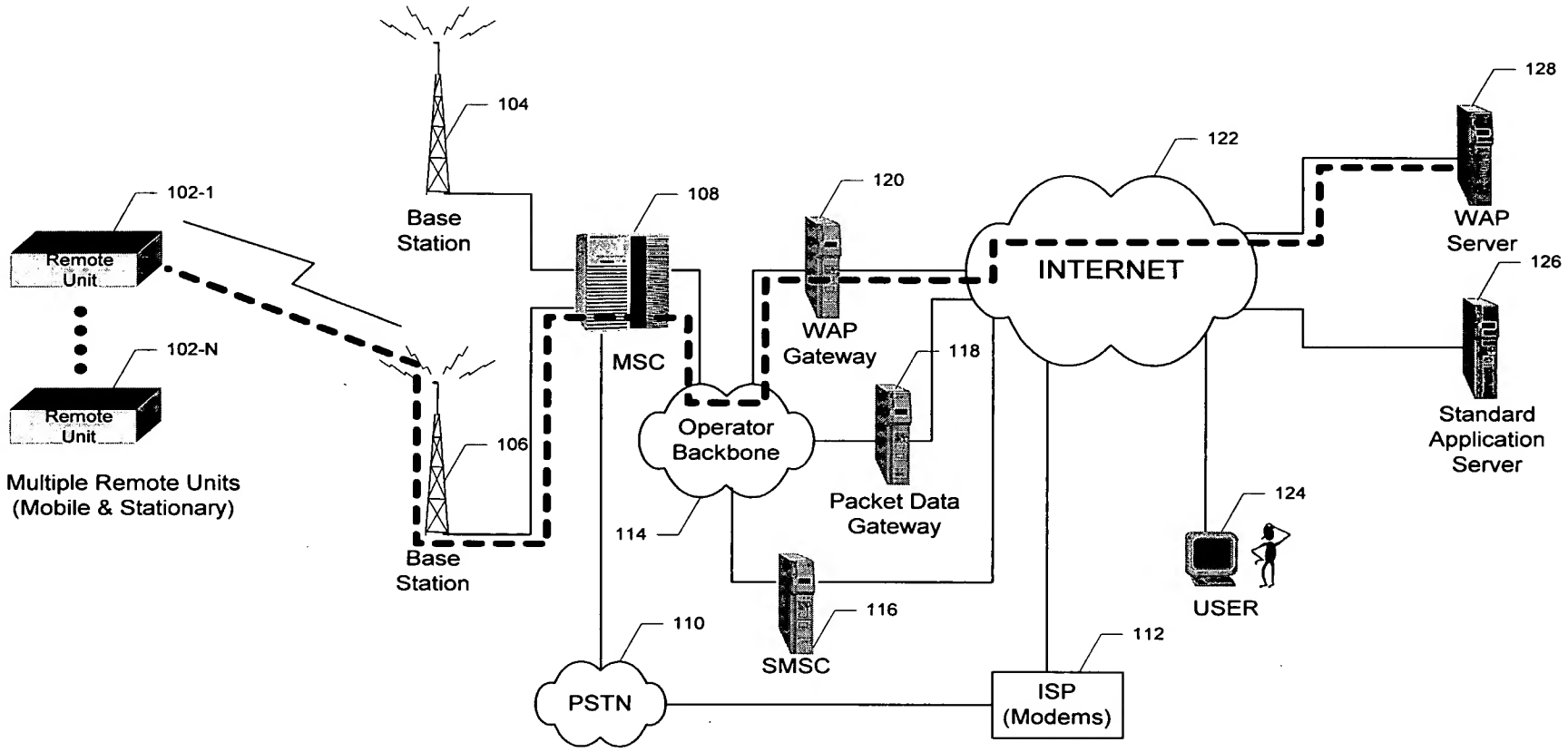
104
Base Station
102-1
Remote Unit
102-N
Remote Unit
Multiple Remote Units (Mobile & Stationary)
106
Base Station
108
MSC
120
WAP Gateway
122
INTERNET
128
WAP Server
126
Standard Application Server
Operator Backbone
118
Packet Data Gateway
114
124
USER
110
PSTN
116
SMSC
112
ISP (Modems)

Figure 1e

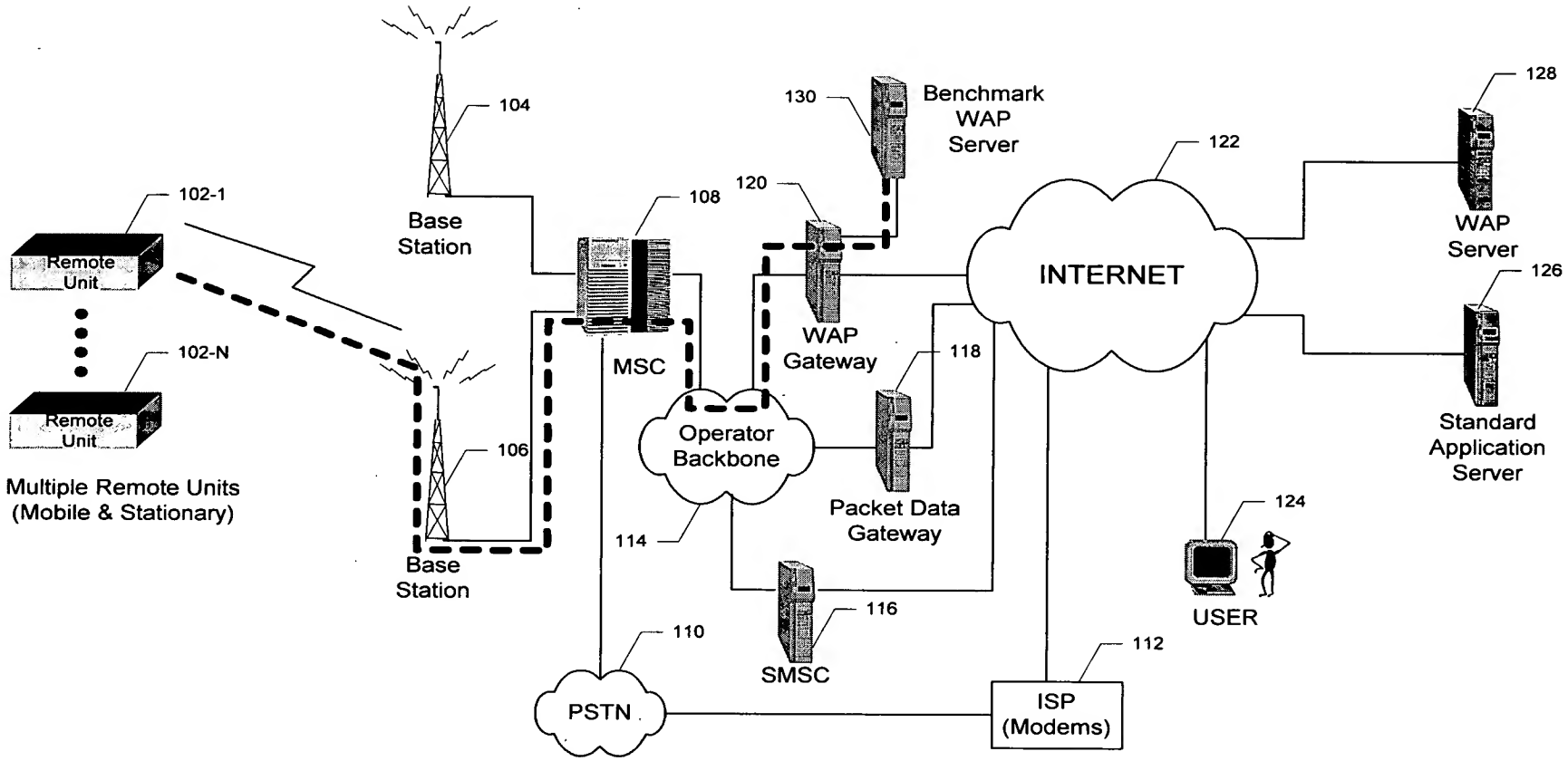

Figure 1f

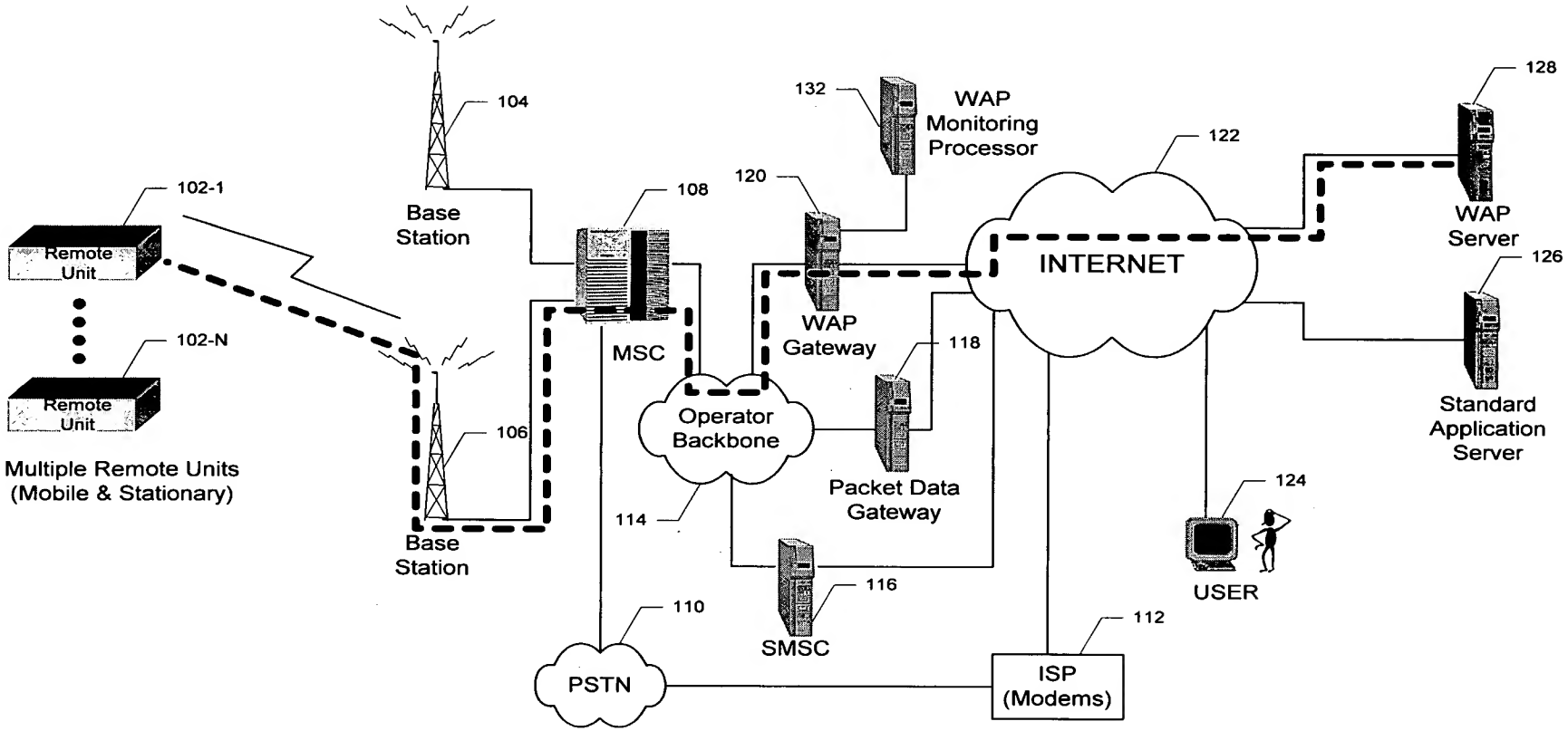

Figure 1g

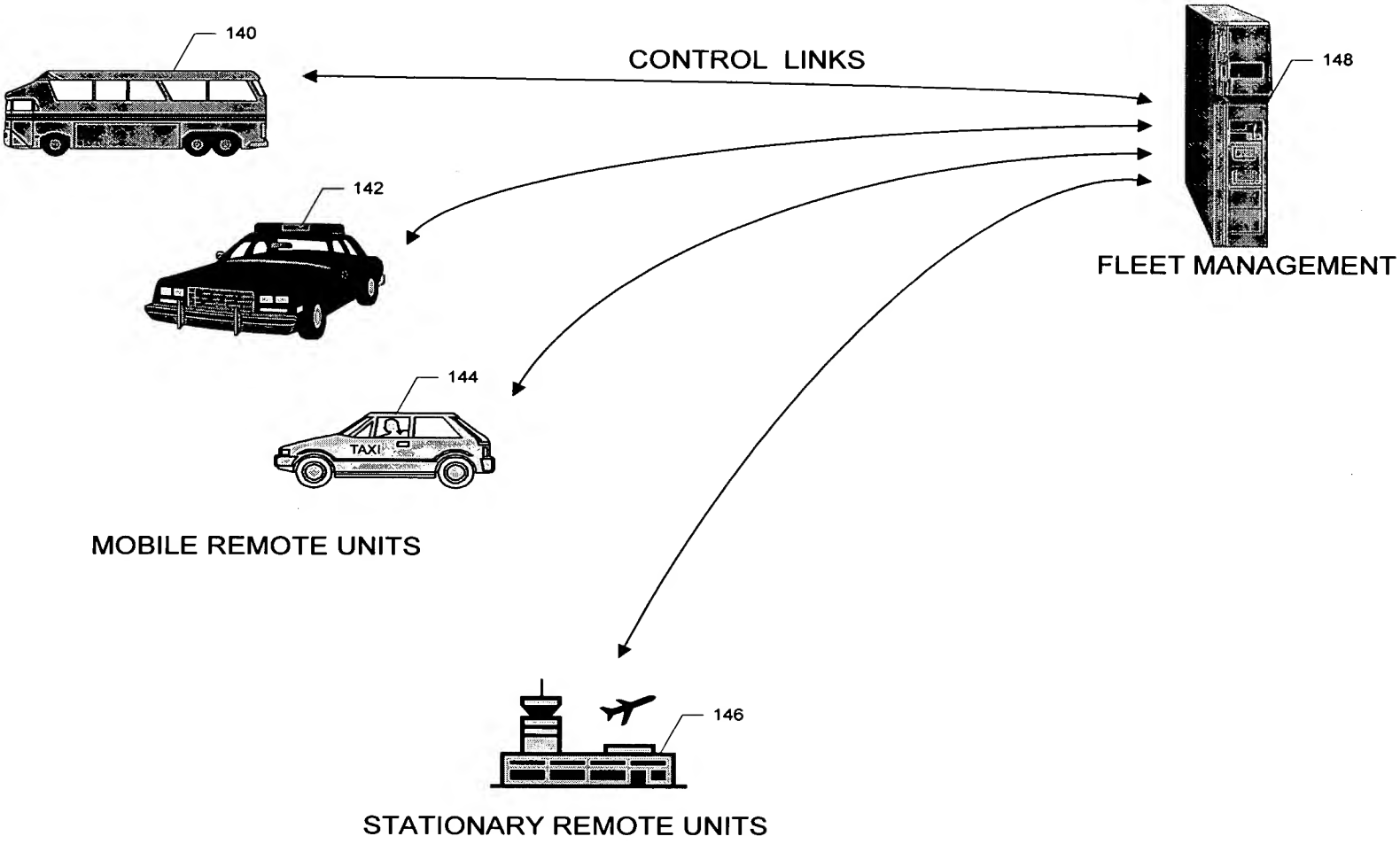
140
CONTROL LINKS
148
142
FLEET MANAGEMENT
144
TAXI
MOBILE REMOTE UNITS
146
STATIONARY REMOTE UNITS

Figure 1h

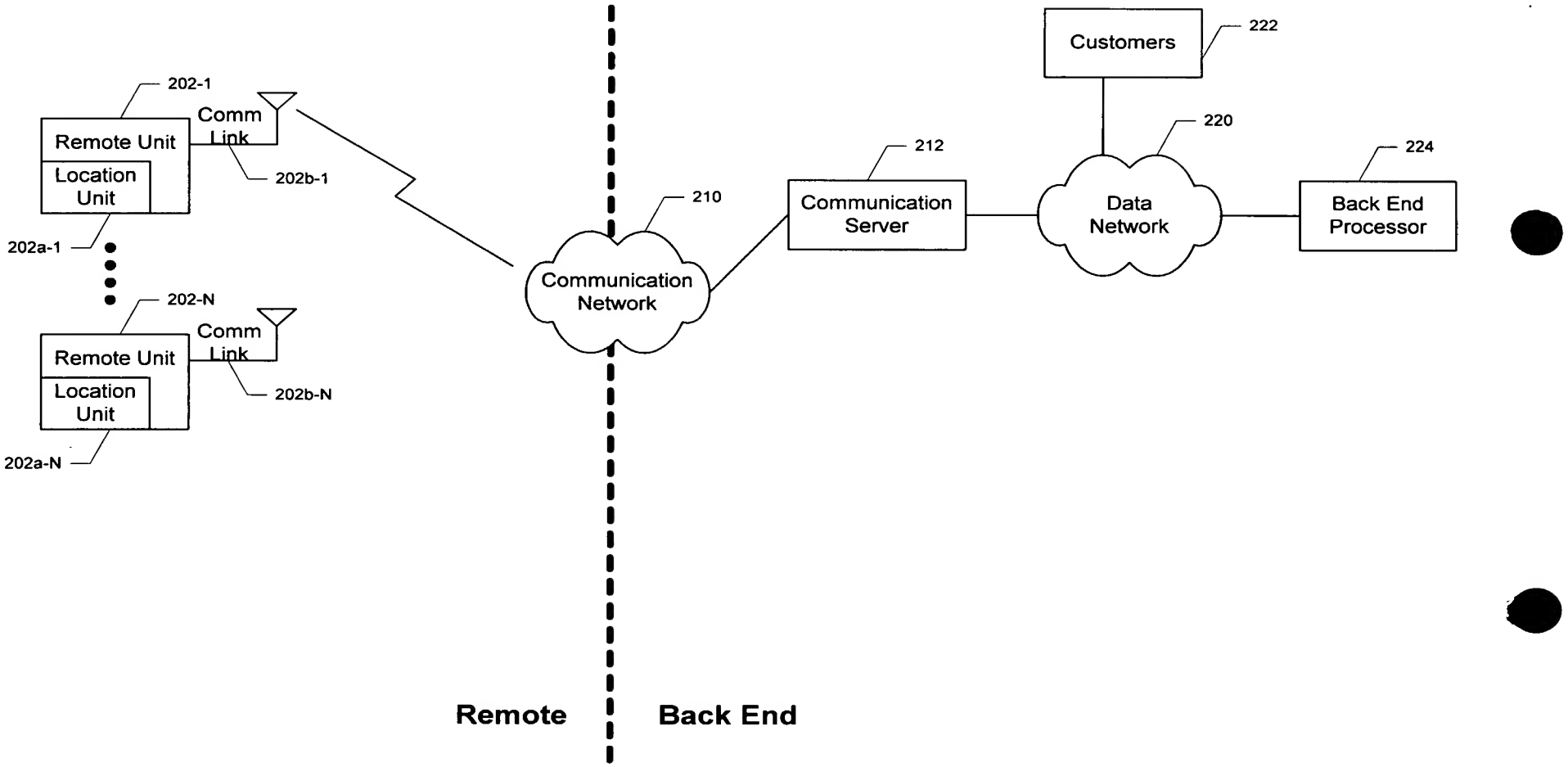
202-1
Comm Link
Remote Unit
Location Unit
202b-1
202a-1
202-N
Comm Link
Remote Unit
Location Unit
202b-N
202a-N
210
Communication Network
212
Communication Server
Customers
222
220
Data Network
224
Back End Processor
Remote
Back End

Figure 2a

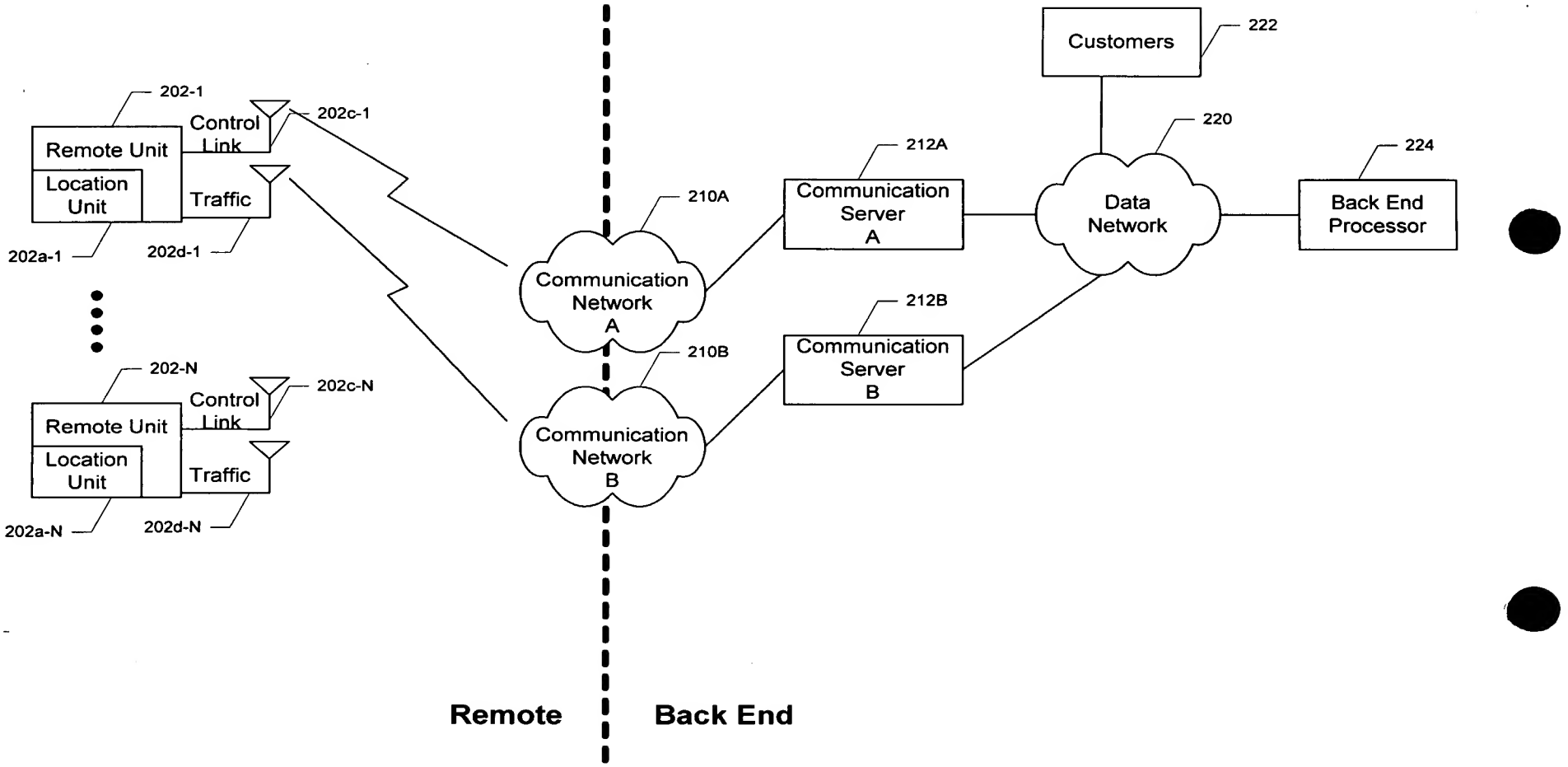
Customers
222
202-1
Control Link
202c-1
Remote Unit
Location Unit
Traffic
202a-1
202d-1
220
212A
224
210A
Communication Server A
Data Network
Back End Processor
Communication Network A
212B
210B
Communication Server B
202-N
Control Link
202c-N
Remote Unit
Location Unit
Traffic
202a-N
202d-N
Communication Network B
Remote
Back End

Figure 2b

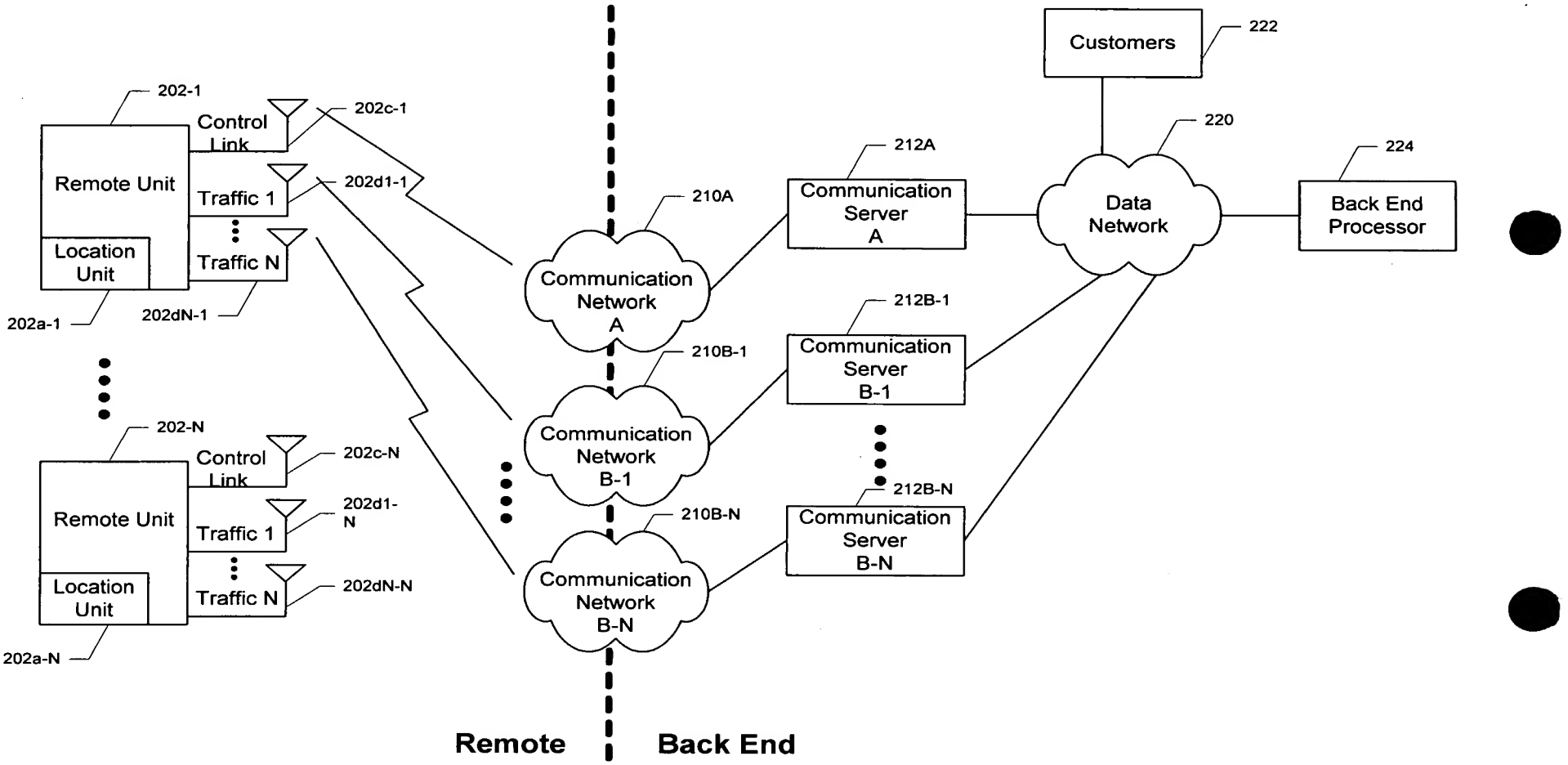
Customers
222
220
224
Data Network
Back End Processor
212A
Communication Server A
212B-1
Communication Server B-1
212B-N
Communication Server B-N
210A
Communication Network A
210B-1
Communication Network B-1
210B-N
Communication Network B-N
202-1
Control Link
202c-1
Remote Unit
Traffic 1
202d1-1
Location Unit
Traffic N
202a-1
202dN-1
202-N
Control Link
202c-N
Remote Unit
Traffic 1
202d1-N
Location Unit
Traffic N
202dN-N
202a-N
Remote
Back End

Figure 2c

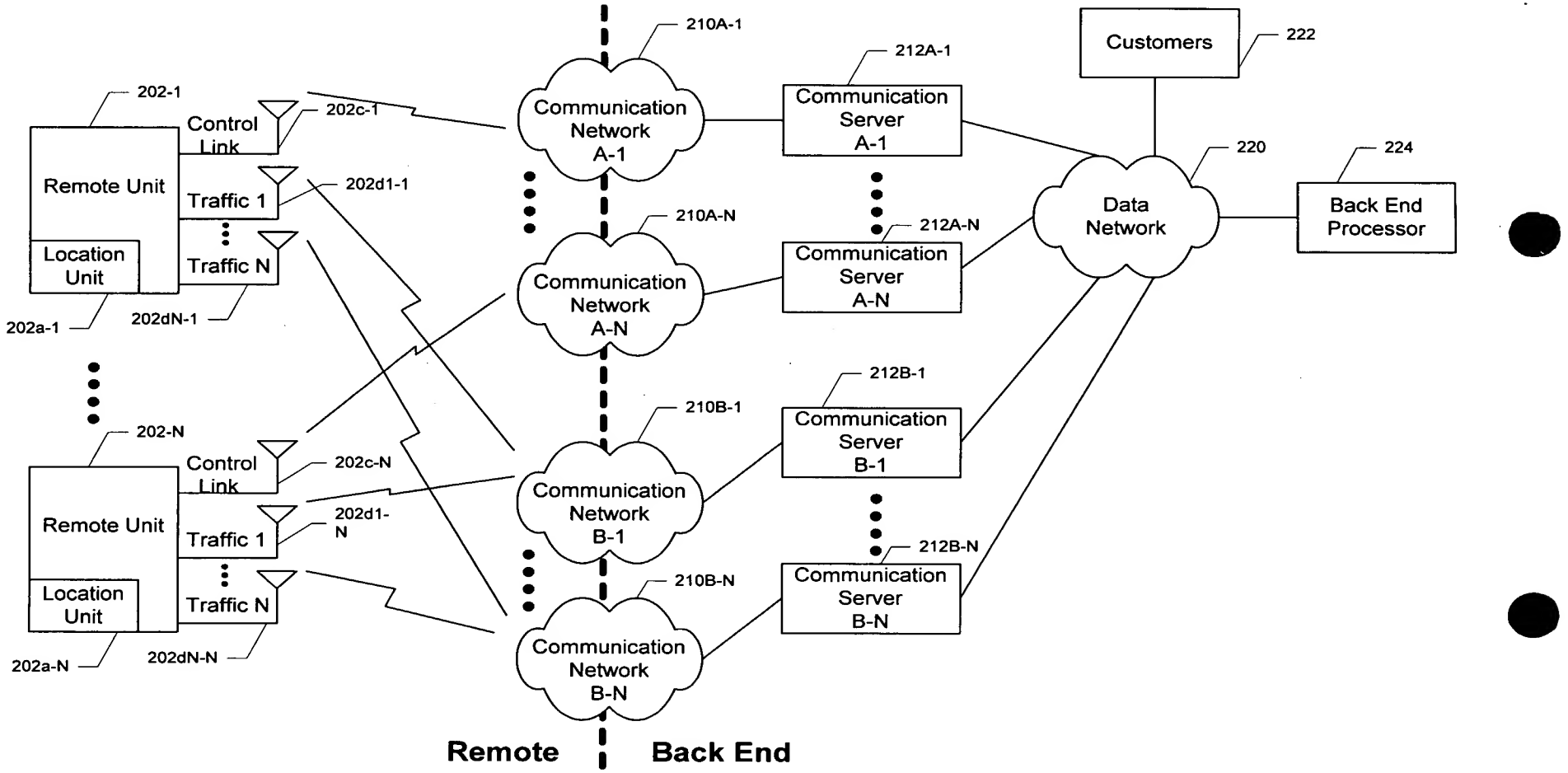
202-1
Control Link
202c-1
Remote Unit
Traffic 1
202d1-1
Location Unit
Traffic N
202a-1
202dN-1
202-N
Control Link
202c-N
Remote Unit
Traffic 1
202d1-N
Location Unit
Traffic N
202a-N
202dN-N
210A-1
Communication Network A-1
210A-N
Communication Network A-N
210B-1
Communication Network B-1
210B-N
Communication Network B-N
212A-1
Communication Server A-1
212A-N
Communication Server A-N
212B-1
Communication Server B-1
212B-N
Communication Server B-N
Customers
222
220
Data Network
224
Back End Processor
Remote
Back End

Figure 2d

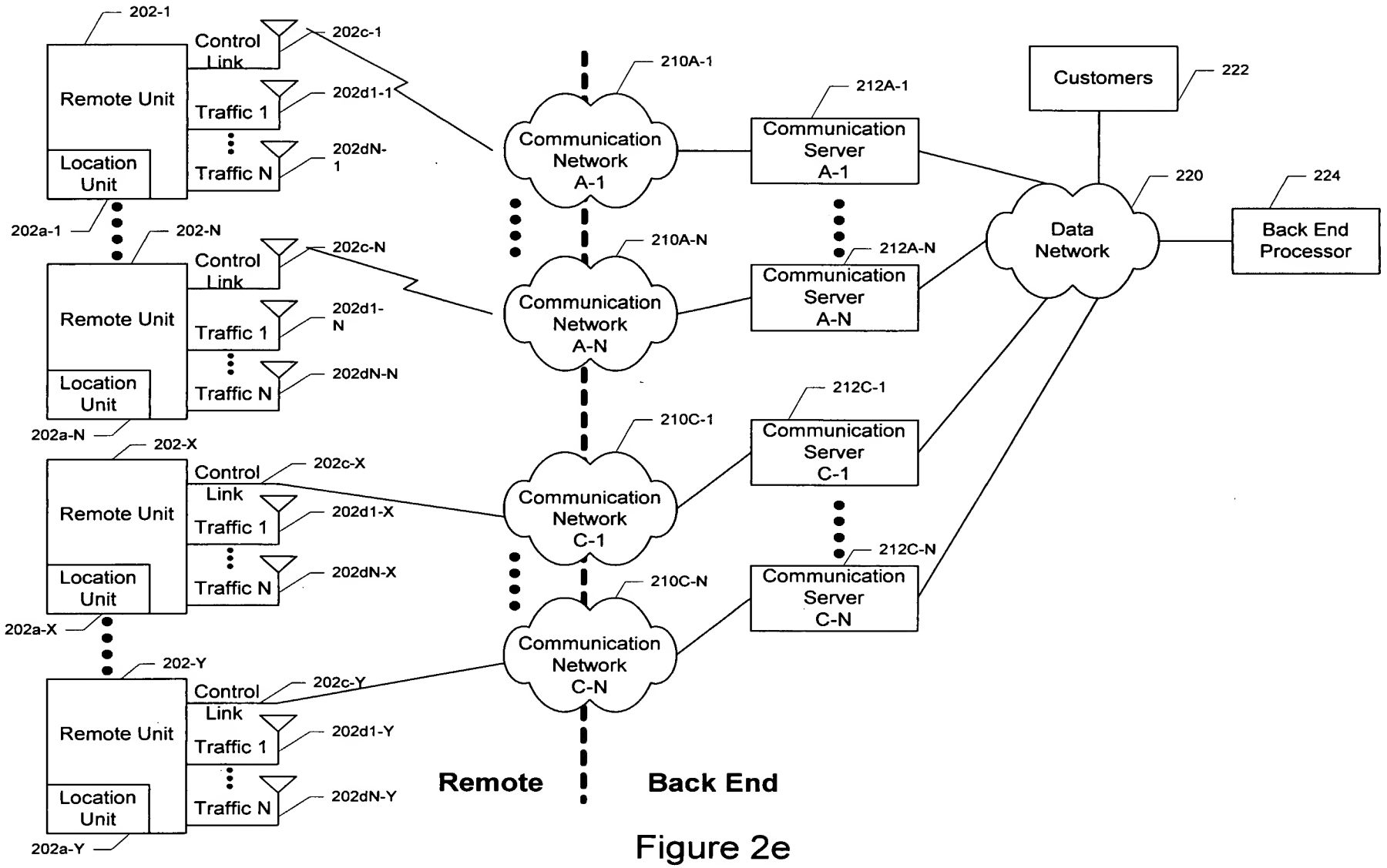
202-1
Control Link
202c-1
Remote Unit
Traffic 1
202d1-1
Location Unit
Traffic N
202dN-1
202a-1
202-N
Control Link
202c-N
Remote Unit
Traffic 1
202d1-N
Location Unit
Traffic N
202dN-N
202a-N
202-X
Control Link
202c-X
Remote Unit
Traffic 1
202d1-X
Location Unit
Traffic N
202dN-X
202a-X
202-Y
Control Link
202c-Y
Remote Unit
Traffic 1
202d1-Y
Location Unit
Traffic N
202dN-Y
202a-Y
210A-1
Communication Network A-1
210A-N
Communication Network A-N
210C-1
Communication Network C-1
210C-N
Communication Network C-N
212A-1
Communication Server A-1
212A-N
Communication Server A-N
212C-1
Communication Server C-1
212C-N
Communication Server C-N
Customers
222
220
Data Network
224
Back End Processor
Remote
Back End

Figure 2e

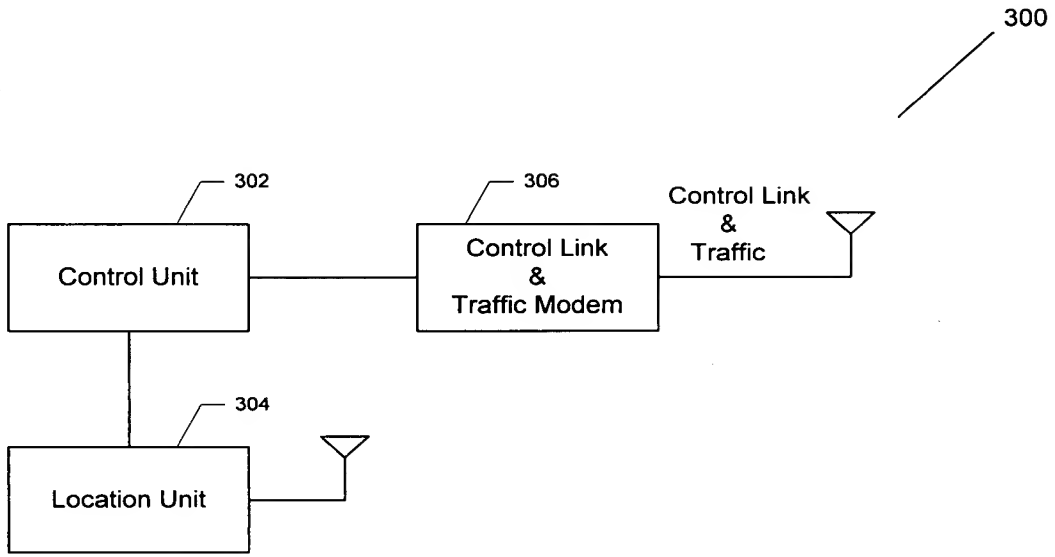
300
302
306
Control Link
&
Traffic
Control Unit
Control Link
&
Traffic Modem
304
Location Unit

Figure 3a

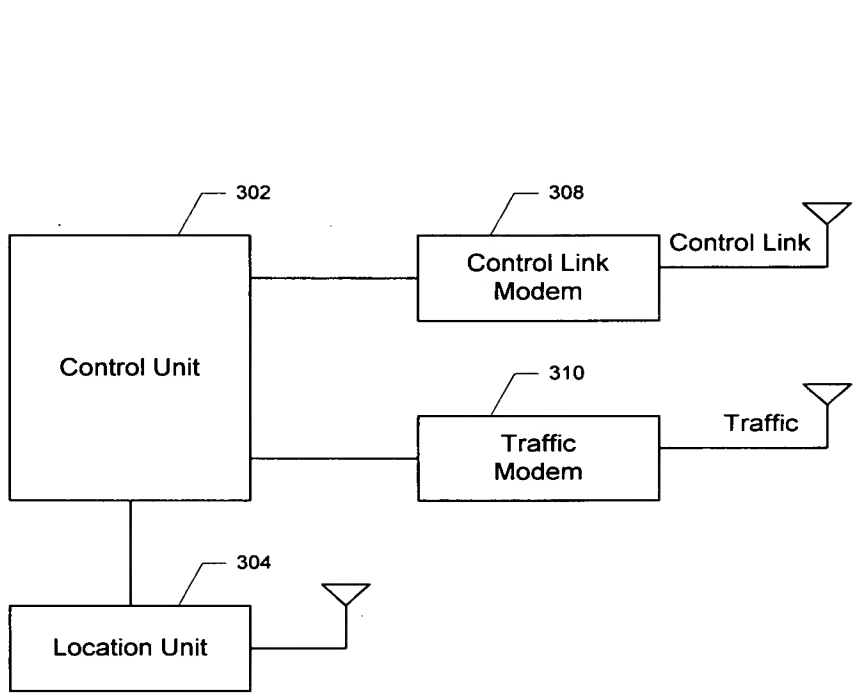
300
302
308
Control Link
Control Link Modem
Control Unit
310
Traffic
Traffic Modem
304
Location Unit

Figure 3b

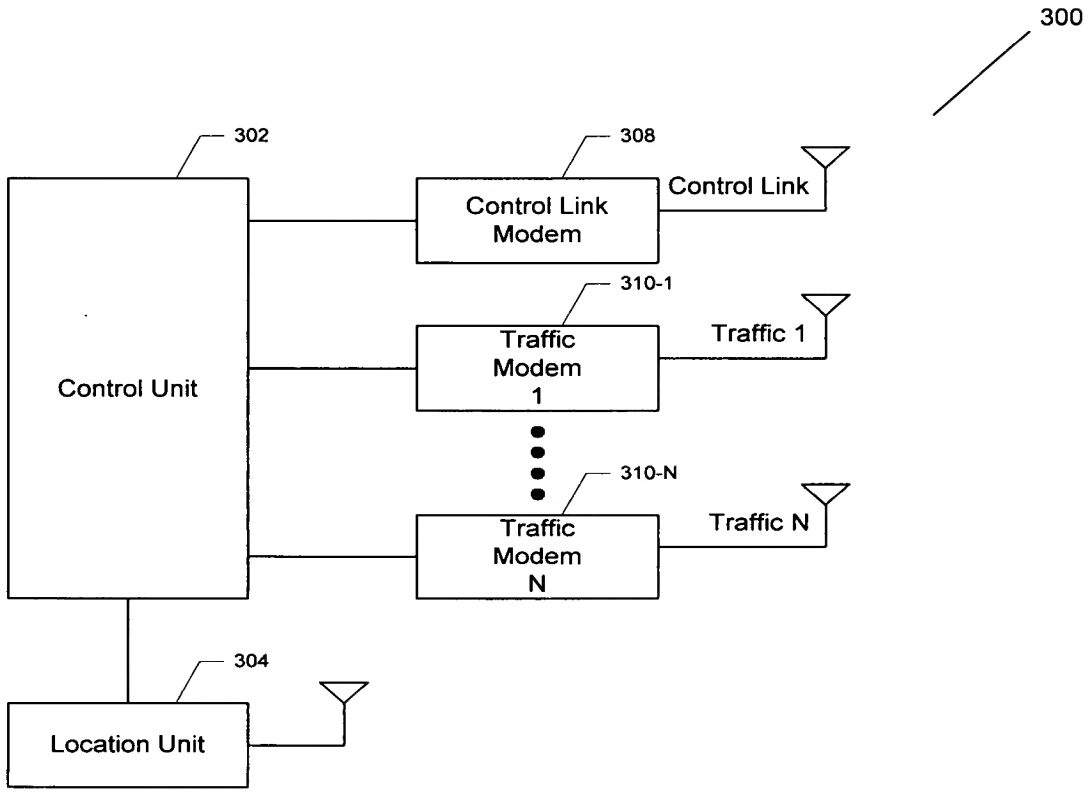
300
302
308
Control Link
Control Link Modem
310-1
Traffic 1
Traffic Modem 1
Control Unit
310-N
Traffic N
Traffic Modem N
304
Location Unit

Figure 3c

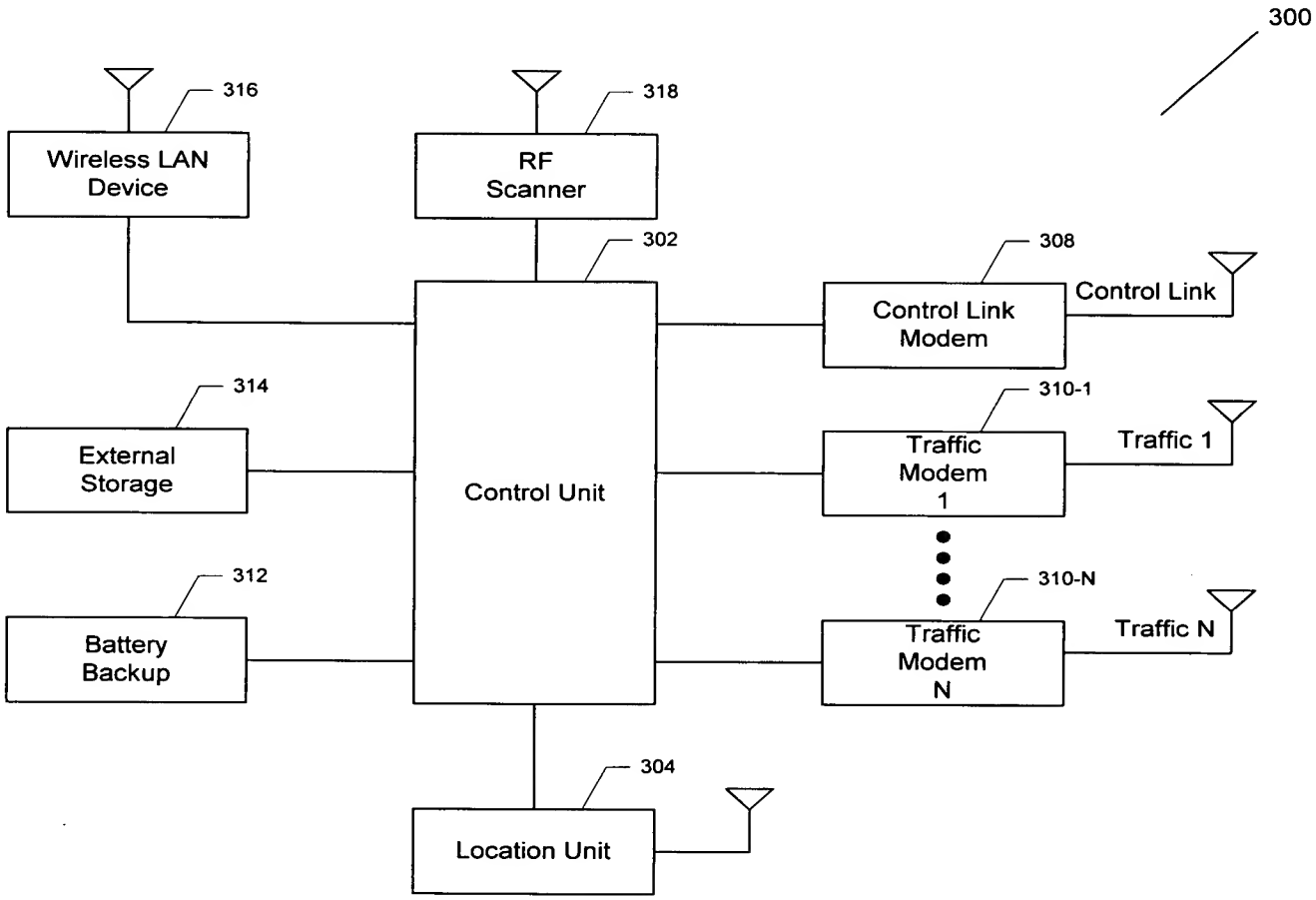
300
316
Wireless LAN Device
318
RF Scanner
302
308
Control Link Modem
Control Link
314
External Storage
Control Unit
310-1
Traffic Modem 1
Traffic 1
312
Battery Backup
310-N
Traffic Modem N
Traffic N
304
Location Unit

Figure 3d

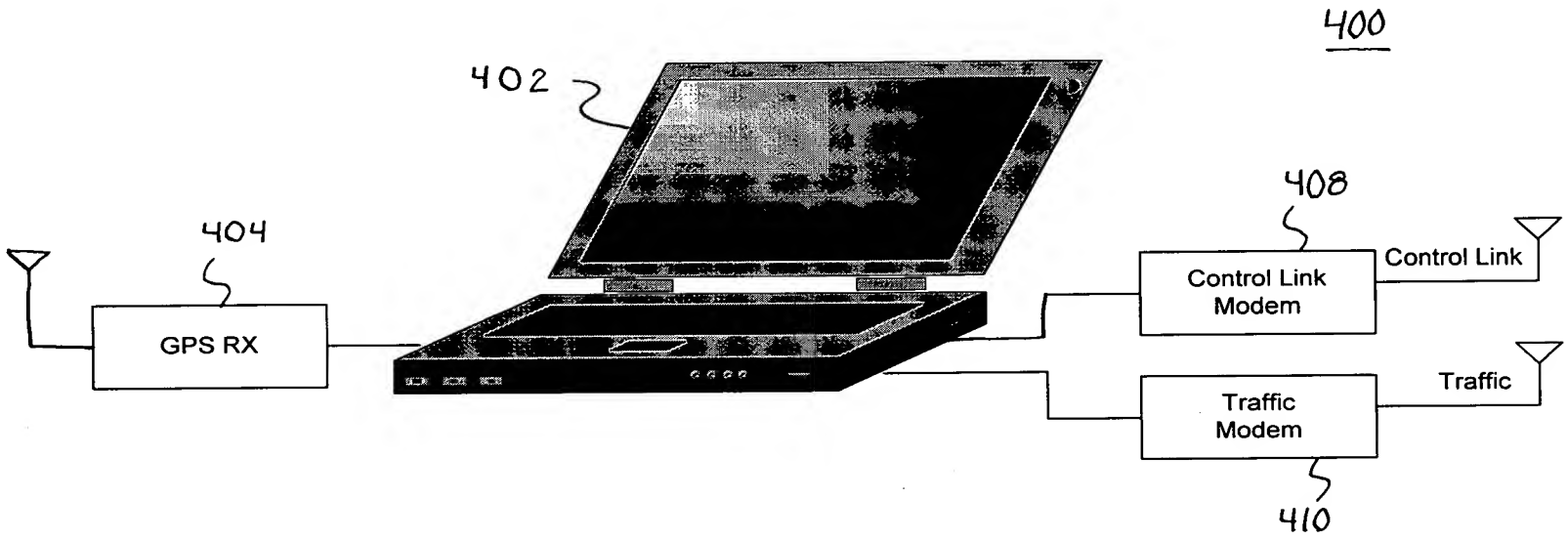
400
402
404
GPS RX
408
Control Link Modem
Control Link
Traffic Modem
Traffic
410

Figure 4a

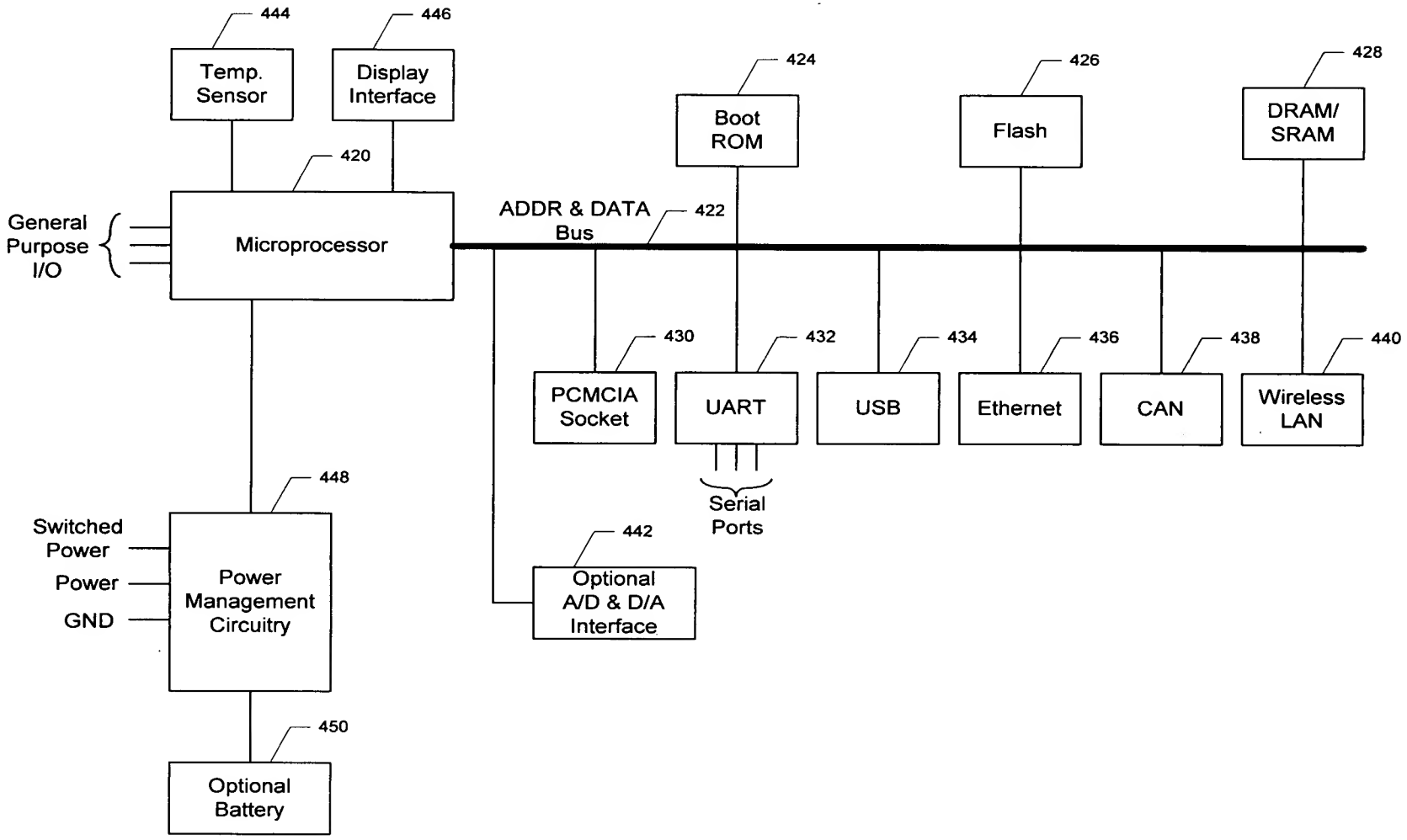
444
446
Temp. Sensor
Display Interface
424
Boot ROM
426
Flash
428
DRAM/ SRAM
420
General Purpose I/O
Microprocessor
ADDR & DATA Bus
422
430
432
434
436
438
440
PCMCIA Socket
UART
USB
Ethernet
CAN
Wireless LAN
Serial Ports
448
Switched Power
Power
GND
Power Management Circuitry
442
Optional A/D & D/A Interface
450
Optional Battery

Figure 4b

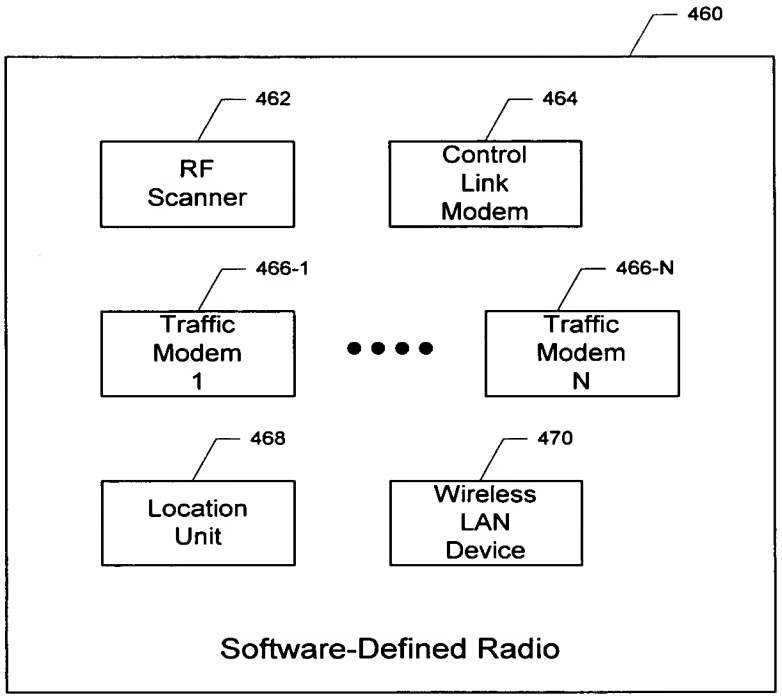
460
462
RF Scanner
464
Control Link Modem
466-1
Traffic Modem 1
466-N
Traffic Modem N
468
Location Unit
470
Wireless LAN Device
Software-Defined Radio

Figure 4c

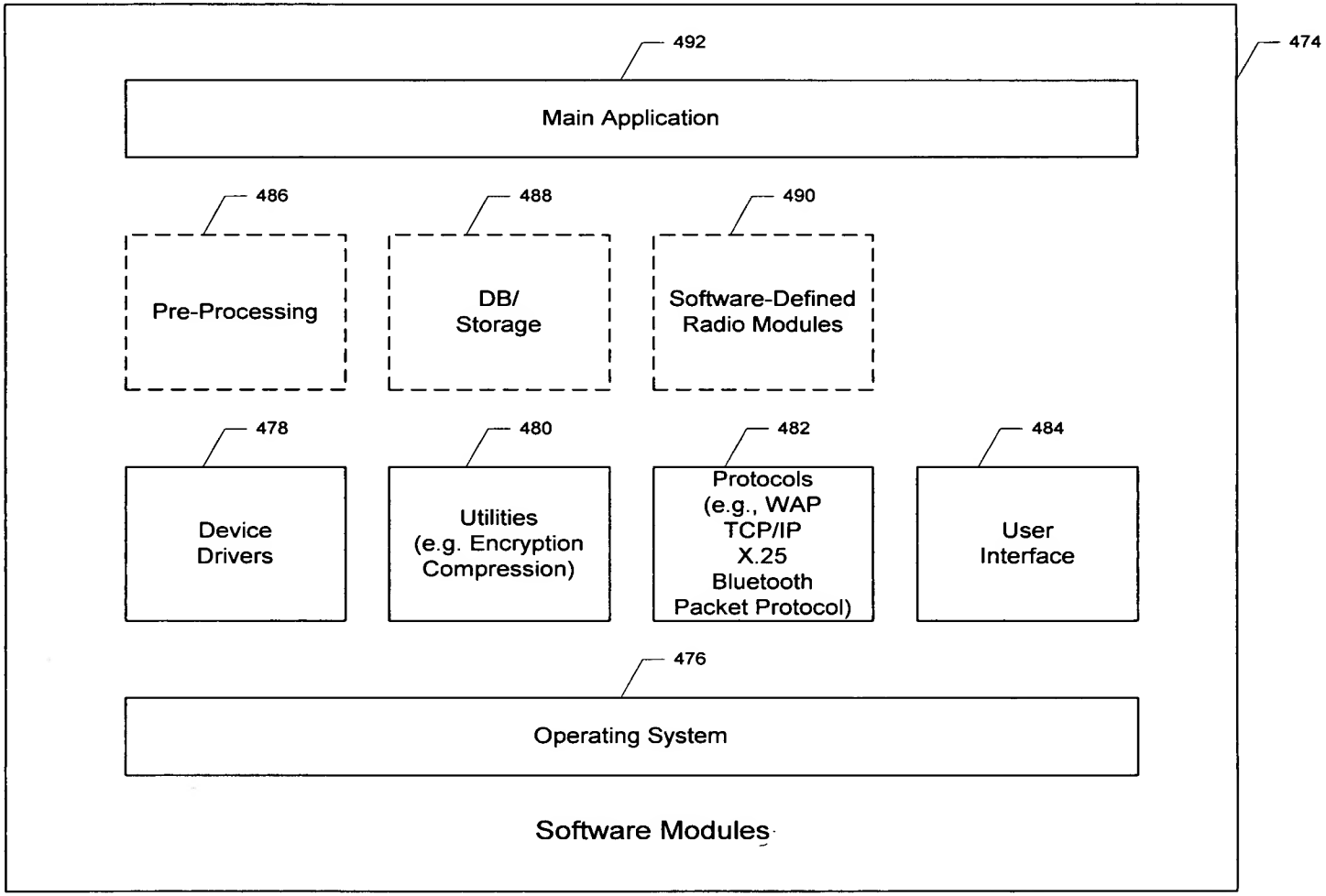
474
492
Main Application
486
488
490
Pre-Processing
DB/
Storage
Software-Defined
Radio Modules
478
480
482
484
Device
Drivers
Utilities
(e.g. Encryption
Compression)
Protocols
(e.g., WAP
TCP/IP
X.25
Bluetooth
Packet Protocol)
User
Interface
476
Operating System
Software Modules

Figure 4d

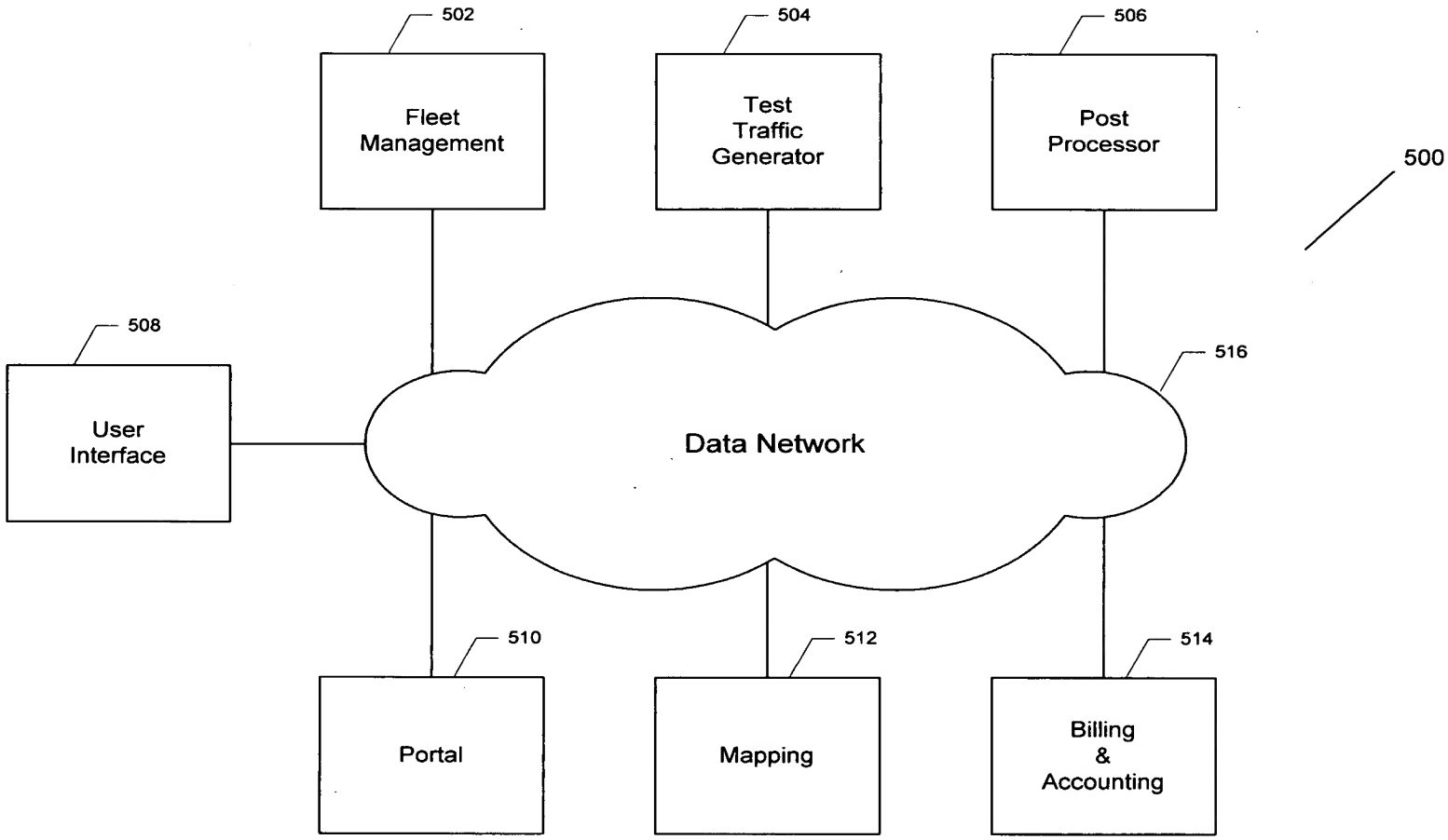
502
504
506
Fleet Management
Test Traffic Generator
Post Processor
500
508
516
User Interface
Data Network
510
512
514
Portal
Mapping
Billing & Accounting

Figure 5a

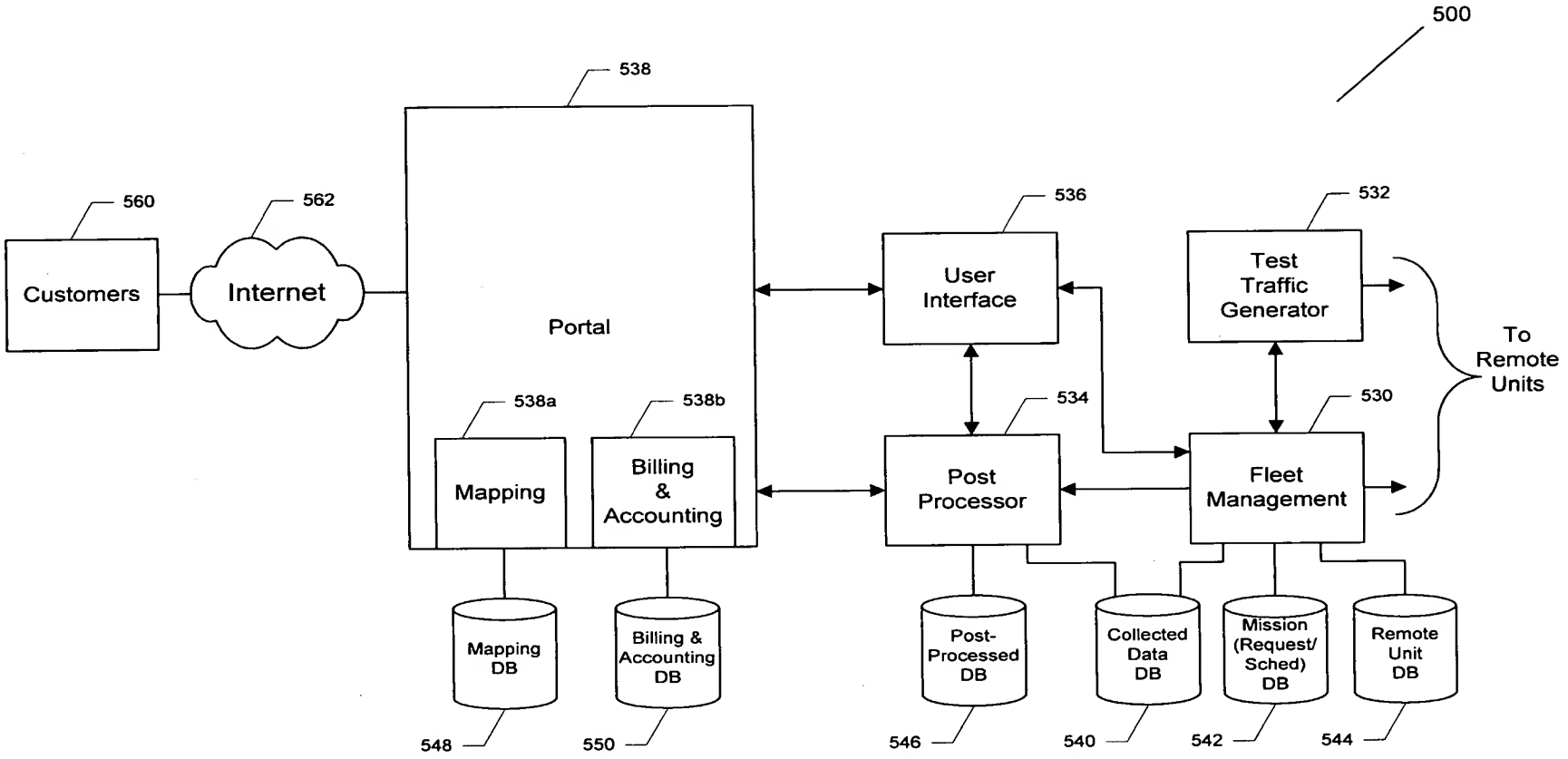
500
538
560
562
Customers
Internet
Portal
536
User Interface
532
Test Traffic Generator
To Remote Units
538a
538b
Mapping
Billing & Accounting
534
Post Processor
530
Fleet Management
Mapping DB
Billing & Accounting DB
Post-Processed DB
Collected Data DB
Mission (Request/ Sched) DB
Remote Unit DB
548
550
546
540
542
544

Figure 5b

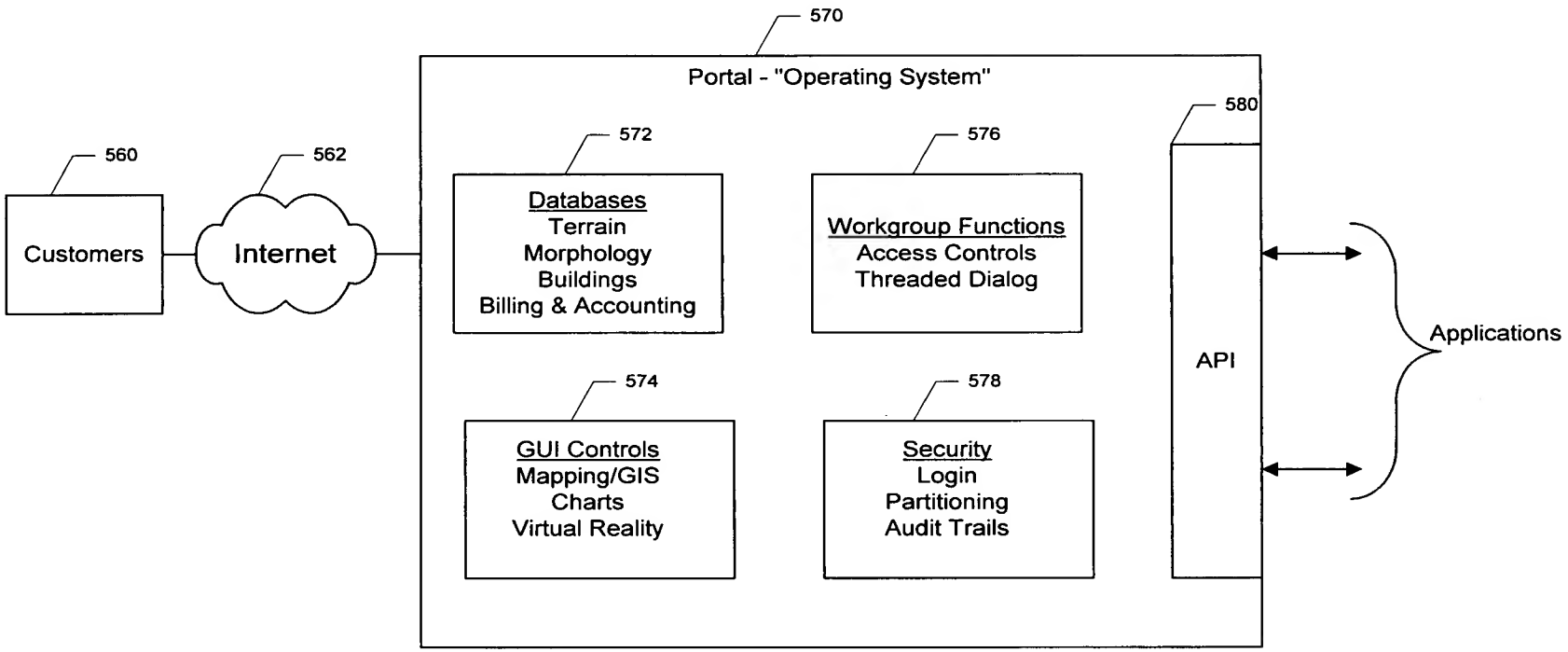
570
Portal - "Operating System"
580
572
576
560
562
Databases
Terrain
Morphology
Buildings
Billing & Accounting
Workgroup Functions
Access Controls
Threaded Dialog
Customers
Internet
API
Applications
574
578
GUI Controls
Mapping/GIS
Charts
Virtual Reality
Security
Login
Partitioning
Audit Trails

Figure 5c

Remote Unit Originated Packet

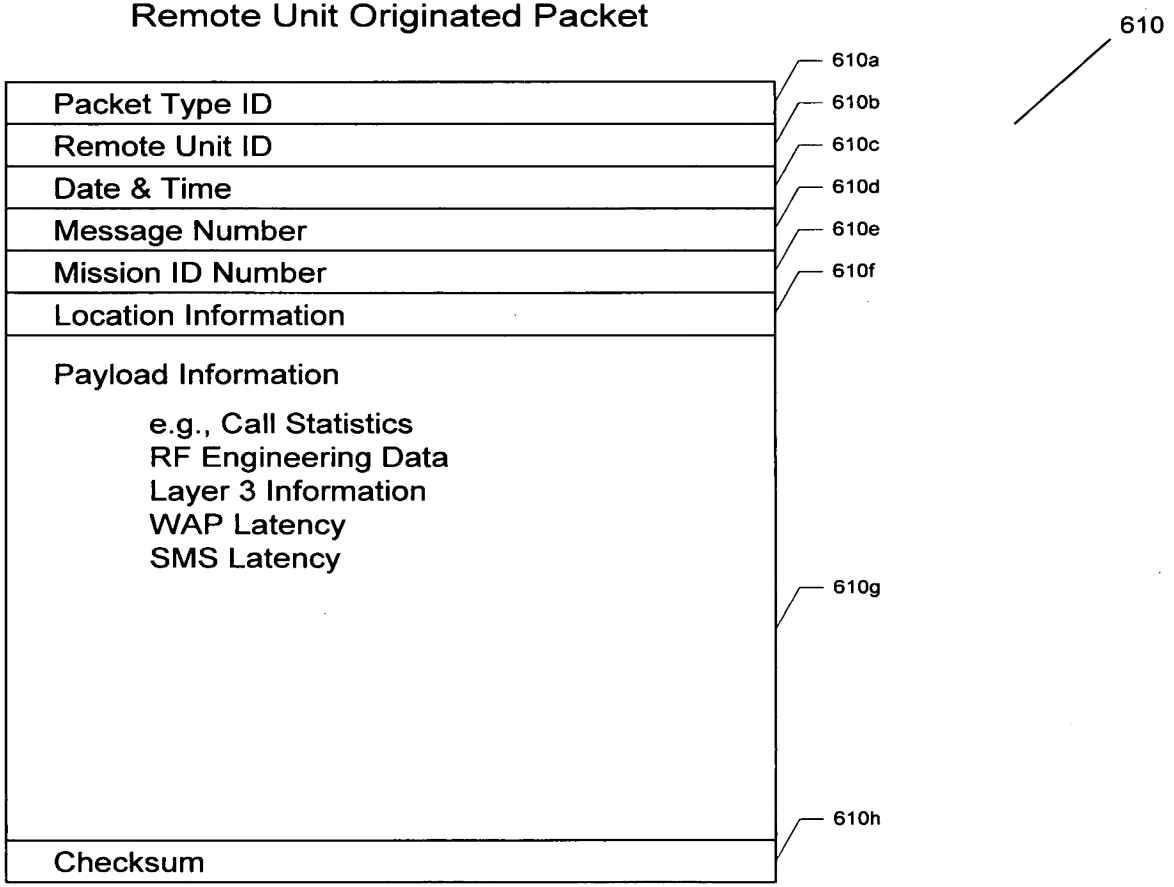

Figure 6a

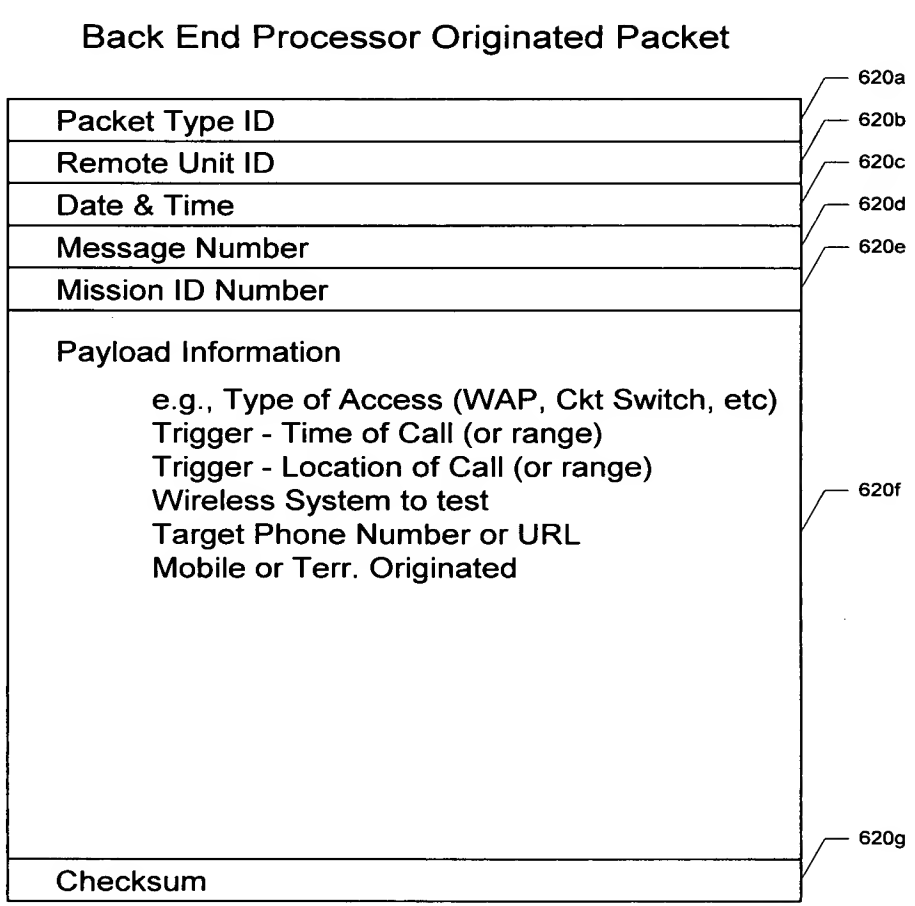
Back End Processor Originated Packet
620
620a
620b
620c
620d
620e
620f
620g
Packet Type ID
Remote Unit ID
Date & Time
Message Number
Mission ID Number
Payload Information
e.g., Type of Access (WAP, Ckt Switch, etc)
Trigger - Time of Call (or range)
Trigger - Location of Call (or range)
Wireless System to test
Target Phone Number or URL
Mobile or Terr. Originated
Checksum

Figure 6b

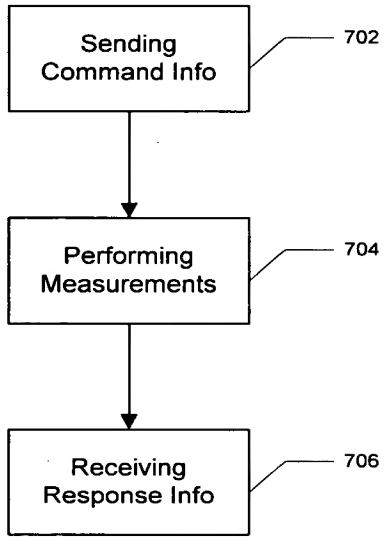
Sending Command Info
702
Performing Measurements
704
Receiving Response Info
706

Figure 7a

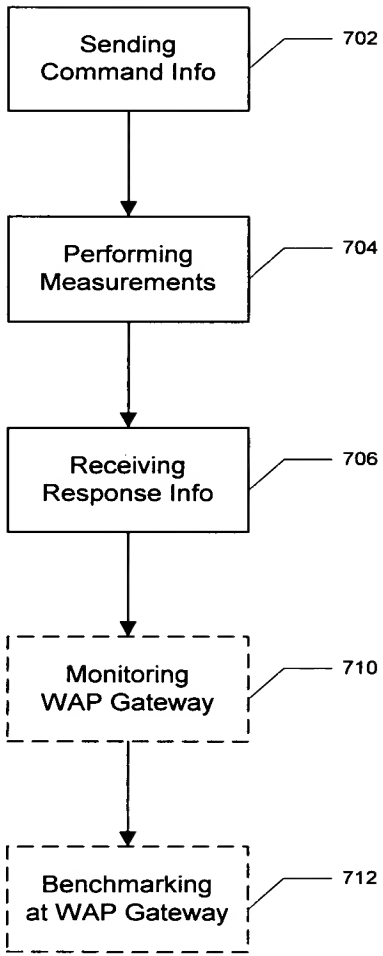
Sending Command Info
702
Performing Measurements
704
Receiving Response Info
706
Monitoring WAP Gateway
710
Benchmarking at WAP Gateway
712

Figure 7b

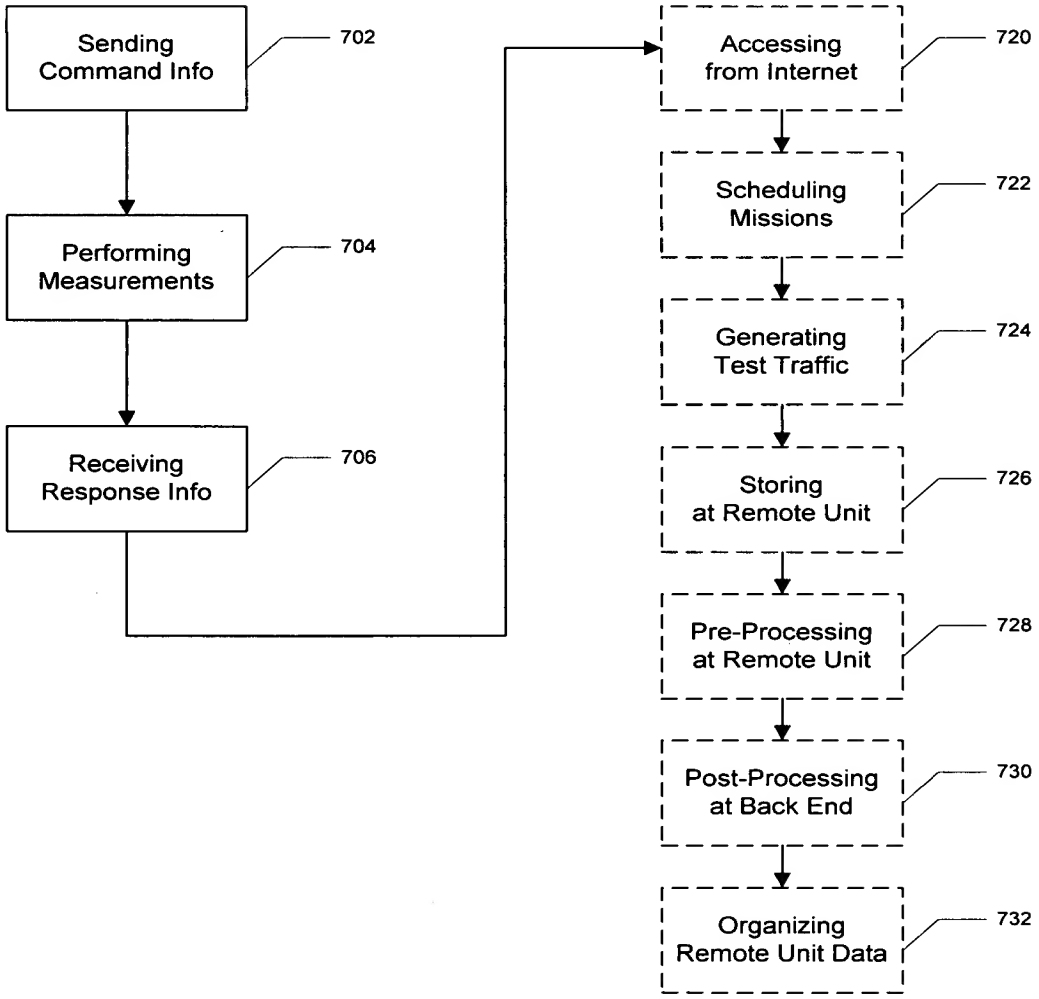
Sending Command Info
702
Performing Measurements
704
Receiving Response Info
706
Accessing from Internet
720
Scheduling Missions
722
Generating Test Traffic
724
Storing at Remote Unit
726
Pre-Processing at Remote Unit
728
Post-Processing at Back End
730
Organizing Remote Unit Data
732

Figure 7c

Service: Compare Portals
Report: Download time
By: city
By: All carriers
Frequency: 15 minutes
Time: 6 am - 12 pm
Period: 03/01/00 - 03/07/00
Benchmark: portal index
Aol.com

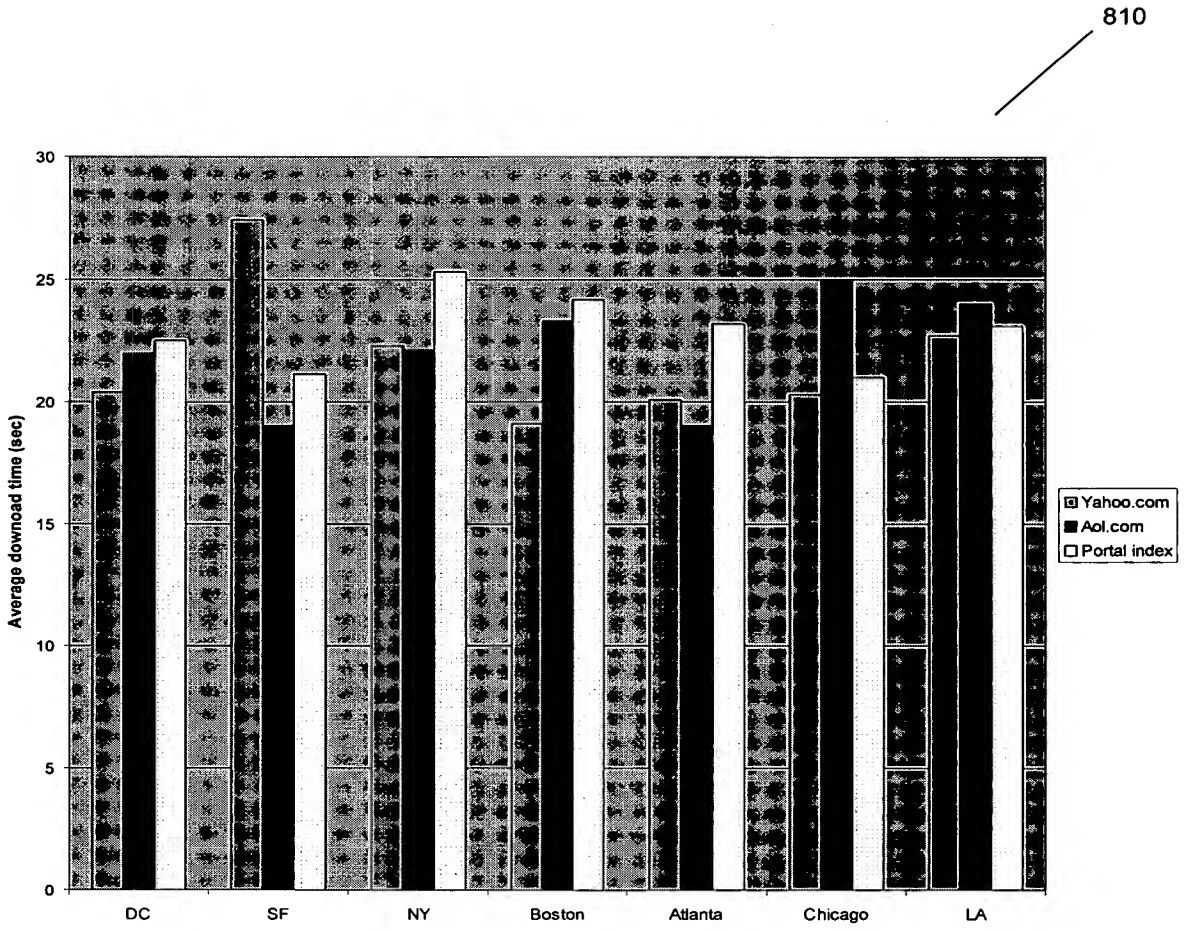

Figure 8a

820

URL: yahoo.com
Service: Compare Wireless Operators
Report: Download time
By: city
By: carrier
Frequency: 30 minutes
Time: 6 am - 9 pm
Period: 03/01/00 - 03/07/00

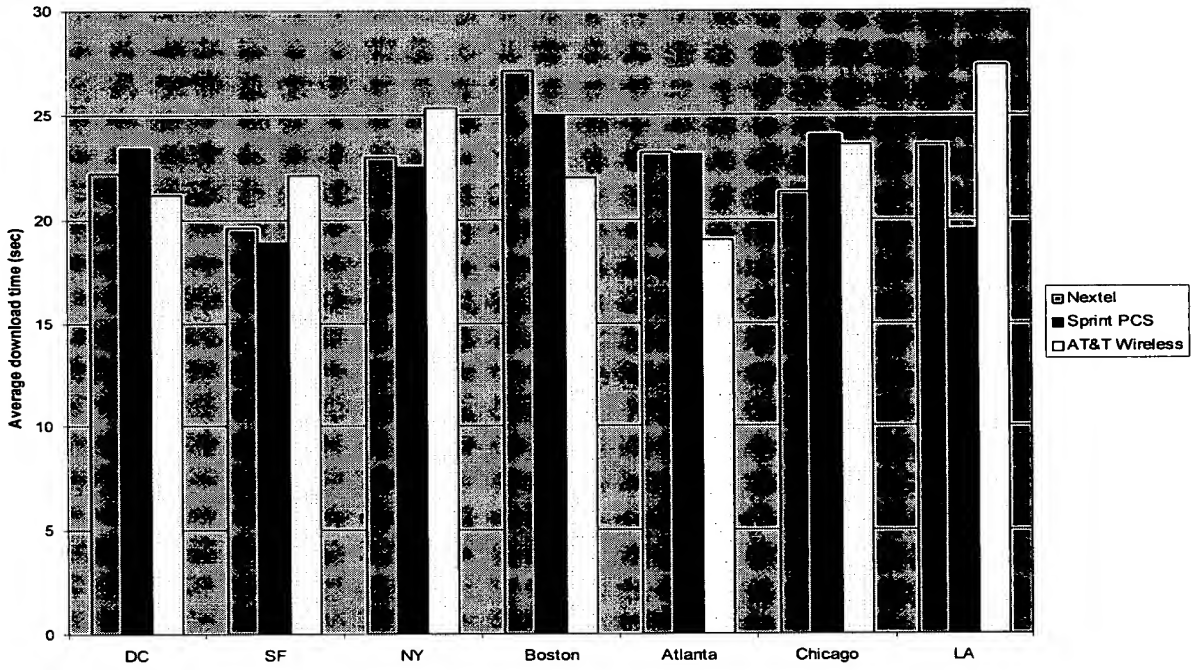

Figure 8b

URL: yahoo.com
Service: Compare Wireless Operators
Report: Completion percent
By: city
By: carrier
Frequency: 30 minutes
Time: 6 am - 9 pm
Period: 03/01/00 - 03/07/00

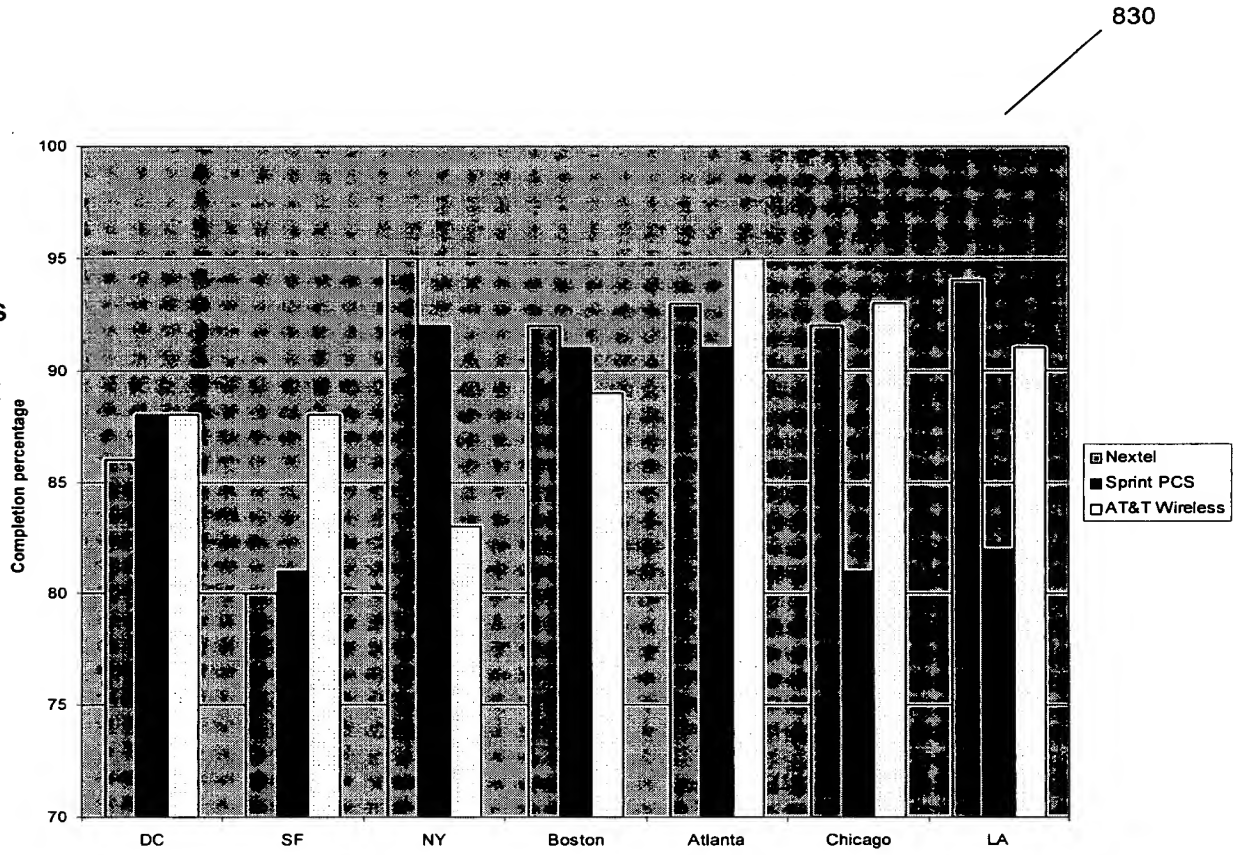

Figure 8c

URL: yahoo.com
Service: Trend Wireless Operators
Report: Completion percent
By: city
By: carrier
Frequency: 15 minutes
Time: 6 am - 9 pm
Period: 03/01/00 - 03/07/00

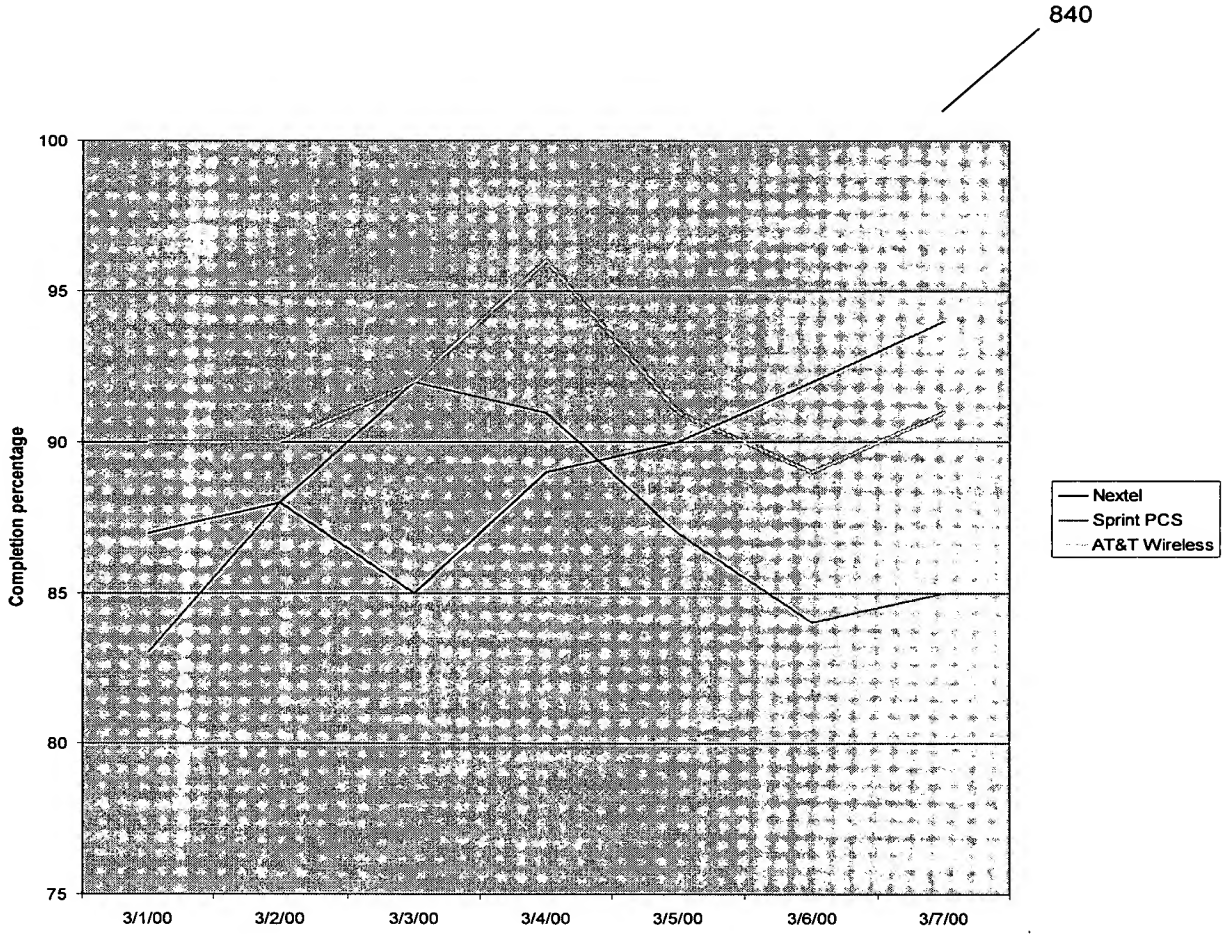

Figure 8d

850

URL: yahoo.com
Service: Gateway Breakdown
Report: Download time
Components 1
By: city
Carrier: Nextel
Frequency: 60 minutes
Time: 12 pm - 12 pm
Period: 03/01/00 - 03/07/00

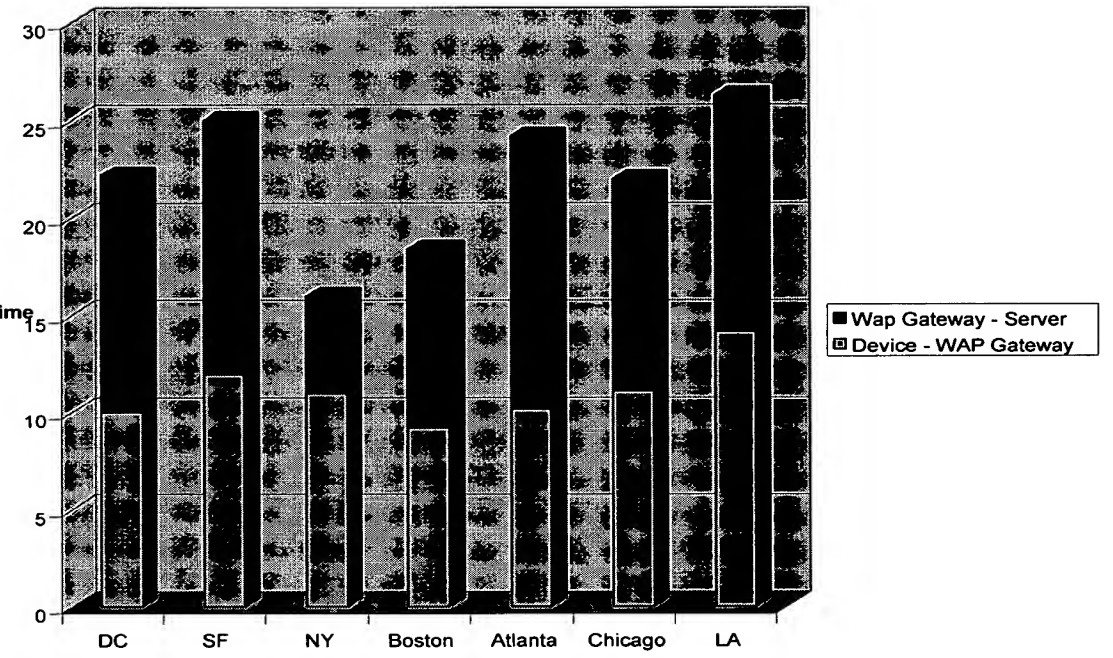

Figure 8e

URL: yahoo.com
Service: Error Stats
Report: Error report
By: all cities
Carrier: all carriers
Frequency: 60 minutes
Time: 12 pm - 12 pm
Period: 03/01/00 - 03/07/00

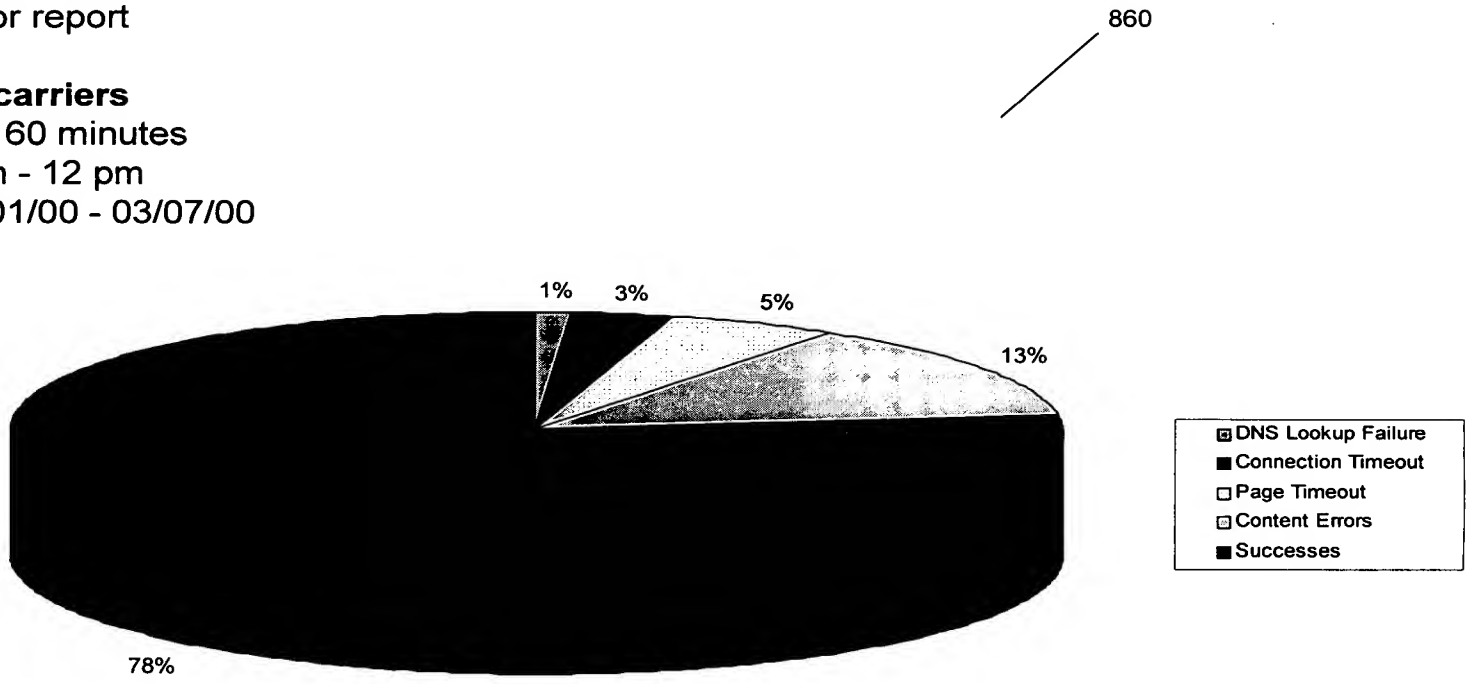

Figure 8f